MONTANA

Forestry Best Management Practices Monitoring

2012 FORESTRY Best Management Practices FIELD REVIEW RESULTS

Department of Natural Resources & Conservation
Forestry Division · Missoula, MT 59804-3199

MONTANA FORESTRY BEST MANAGEMENT PRACTICES MONITORING

2012 FORESTRY BMP FIELD REVIEW REPORT

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TABLE OF CONTENTS

PAGE

INDEX OF TABLES

ACKNOWLEDGMENTS

In 2012 the Forestry Assistance Bureau, Forestry Division of the Montana Department of Natural Resources and Conservation once more undertook the task of completing the Forestry Best Management Practices (BMP) Field Reviews. The name of this process was changed from "AUDITS" to "FIELD REVIEWS" to more accurately reflect what was really being done.

The Division graciously acknowledges the many people who gave their time and energy toward the review effort. Thank you to all of the Field Review Team Members who traveled extensively, worked long days in the field, and tackled many difficult decisions in a professional manner. Thanks also go to the Environmental Quality Council and Governor's Office, to all who supplied information to select the sites, and to those who gave access to private lands. Thanks to the representatives from Industry, the U.S. Forest Service, the Bureau of Land Management, the Department of Natural Resources and Conservation Trust Land Management Division, and the Family Forest Landowners for their cooperation in providing field review site information and/or team members.

Special thanks to Gary Frank, Don Kasten, and Jeff Schmalenberg, the three Team Leaders who put in an extraordinary effort to assure the field work went smoothly. They did an outstanding job.

Roger Ziesak

EXECUTIVE SUMMARY

The Forestry Best Management Practice (BMP) field review process is used to evaluate whether BMPs are being applied, applied correctly, and if they are effective in limiting non-point source pollution from logging operations in Montana, in other words – is water quality being preserved? The Montana Department of Natural Resources and Conservation (DNRC), Forestry Division, evaluates forest practices for BMP implementation every two years, and reports the findings to the Montana Environmental Quality Council (EQC). This report summarizes the findings of Montana's 2012 Forestry BMP Field Reviews, and follows similar reviews and reports that have been done biennially since 1990.

In 2012, three interdisciplinary teams conducted the field reviews. Each team was composed of a fisheries biologist, a forester, a hydrologist, a representative of a conservation group, a road engineer, a soil scientist, and a non-industrial private forest (NIPF) landowner or logging professional. DNRC used established site selection criteria to select forty-two (42) new timber harvest sites harvested in 2010 or 2011. The field review teams evaluated a maximum of sixty (60) BMPs, 49 of which are forestry BMPs and the remaining 11 are Streamside Management Zone (SMZ) BMPs, at each site, rating application and effectiveness for each BMP on a five-point scale.

A total of 42 field review sites were evaluated for **BMP Application.** Field Review results showed that across all ownerships, **BMPs were properly applied 98% of the time.** Although many harvest sites had at least one instance where a BMP was inadequately applied, a majority of these departures were minor (88%) and did not cause erosion or deliver material to a stream. Eleven percent (12%) of the sites had one or more major BMP departures in application. In the 2010 field reviews, 19% had major BMP departures in application. The application of eight high risk BMPs were also evaluated separately because these are among those most important for protecting soil and water resources. Ninety-Three percent (93%) of these high risk BMPs were properly applied.

The field review teams also evaluated the same 42 sites for **BMP effectiveness**. Field review results showed that across all ownerships, **BMPs were effective in protecting soil and water resources 98% of the time.** Sixteen percent (16%) of all sites had some minor departures in BMP effectiveness. This compares with 48% in 2010. Minor departures in effectiveness produce minor impacts to soil and water resources; eroded material reaches draws, but not streams. Sixteen percent (1600%) of the sites had one or more major departures in BMP effectiveness compared to 19% in 2010. Ninety-six percent (96%) of the eight high risk BMPs evaluated were rated as providing adequate protection to soil and water resources.

The greatest frequency of departures from the BMPs, and the most identified impacts, were associated with road maintenance and road surface drainage. This report includes a list of the most problematic BMPs in Table 16 on page 22.

The Field Review teams also evaluated application and effectiveness of the Montana SMZ Law. For both application and effectiveness, a total of 14 SMZ Rules departures noted (11 for application and 3 for effectiveness) out of the 670 rated. Application rating departures were eight rated as minor and three as major. Effectiveness rating departures were one rated as minor and two as major.

Summary of 2012 BMP and SMZ Application and Effectiveness, by Ownership Group

Practice	DNRC	Federal	Industry	NIPF	Totals
BMP Application	99%	97%	98%	96%	98%
BMP Effectiveness	99%	98%	99%	99%	99%
SMZ Application	100%	97%	99%	93%	97%
SMZ Effectiveness	100%	99%	99%	99%	99%

Comparison of BMP Field Review Results – 1990 through 2012

Category	2012	2010	2008	2006	2004	2002	2000	1998	1996	1994	1992	1990
Application of practices that meet or exceed BMP requirements.	98%	97%	97%	96%	97%	96%	96%	94%	92%	91%	87%	78%
Application of high risk practices that meet or exceed BMP requirements.	93%	93%	90%	89%	89%	90%	92%	84%	81%	79%	72%	53%
Number of sites with at least one major departure in BMP application.	3 of 42 (7%)	5 of 45 (11%)	8 of 42 (19%)	4 of 44 (9%)	5 of 39 (13%)	10 of 43 (23%)	4 of 42 (10%)	8 of 47 (17%)	12 of 44 (27%)	17 of 46 (37%)	20 of 46 (43%)	27 of 44 (61%)
Average number of departures in BMP application, per site.	0.76	0.87	1.19	1.52	1.30	1.80	1.40	2.00	3.00	3.90	5.60	9.00
Percentage of practices providing adequate protection.	99%	98%	97%	97%	99%	97%	98%	96%	94%	93%	90%	80%
Percentage of high risk practices providing adequate protection.	96%	96%	91%	92%	95%	92%	93%	89%	86%	83%	77%	58%
Number of sites having at least one major / temporary or minor / prolonged impact.	5 of 42 (12%)	7 of 45 (16%)	8 of 42 (19%)	7 of 44 (16%)	10 of 39 (25%)	15 of 43 (35%)	9 of 42 (21%)	12 of 47 (26%)	15 of 44 (34%)	13 of 46 (28%)	17 of 46 (37%)	28 of 44 (64%)
Average number of impacts per site.	0.38	0.47	1.02	1.05	0.56	1.30	1.00	1.50	2.30	3.00	4.60	8.00

INTRODUCTION

The forest lands of Montana are also the headwaters for several major river basins and produce large quantities of high quality water. This water nurtures some of the West's best fisheries and is used for irrigation and livestock, as well as for domestic, recreational and industrial purposes. These same lands grow the timber resources that sustain the forest products industry, one of Montana's major industries. All products from Montana's 22.5 million acres of forested land contribute in an essential manner to Montana's economy and way of life.

Montana's water quality protection program for forestry involves a combination of regulatory and non-regulatory approaches. Since the 1970's, non-regulatory Forestry Best Management Practices have provided guidance as minimum water quality protection standards for forestry operations. In 1987 Congress amended the Clean Water Act and added Section 319 to address non-point sources of pollution. Section 319 directed all states to develop non-point source pollution plans to address non-point source pollution problems. The Forestry BMPs provide Montana's Section 319 compliance.

At this same time, concern over the impacts of forest management on Montana's watersheds prompted the 1987 Montana Legislature to pass House Joint Resolution 49. This resolution directed the Montana Environmental Quality Council (EQC) to study "how current forest management practices are affecting watersheds in Montana." (Zackheim, 1988) The EQC established a BMP technical committee that developed Montana's first statewide forestry BMPs in 1987. In 1989, after two years of work, an interdisciplinary working group (BMP Working Group) released the revised Forestry Best Management Practices. Since that time, the BMP Work Group has overseen the biennial process. In the interim between the 1996, 1998, 2000, 2002, and 2008-2010 field review cycles the BMP Work Group reviewed and revised the 1989 BMPs. The last revision was to address biomass in the BMPs – this change is minor and has no direct impact on the methodology used in the field review process. The 2004 version of the Best Management Practices for Forestry in Montana (Appendix A) was adopted for use in the 2010 field reviews.

Forestry BMP field reviews have been conducted previously in Montana. As part of HJR-49, field review teams conducted the first statewide assessment of forest practices for BMPs during the summer of 1988 (Zackheim, 1988). In 1989 the University of Montana, under the Flathead Basin Water Quality and Fisheries Cooperative, reviewed more sites for BMPs in the Flathead River drainage (Ehinger and Potts, 1990). The Montana Legislature has directed DNRC to conduct a further series of statewide BMP field reviews in 1990, 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006, 2008, 2010 and 2012 (Schultz, 1990 and 1992; Frank, 1994; Mathieus, 1996; Fortunate, et al., 1998; Ethridge and Heffernan, 2000; Ethridge, 2002 and 2004; Rogers, 2006; Ziesak 2008 and 2010).

Forestry BMPs, if properly applied, can limit non-point source pollution--the kind of diffuse pollution that forestry operations can produce, such as sediment from a road or timber harvest. The BMP field review process has been consistently used since 1990 to evaluate whether BMPs are being properly applied and if they are effectively limiting non-point source pollution.

Prior to 1989, forestry water quality was addressed through a voluntary approach as part of the State's 1988 non-point source assessment and management plan. In 1989 the Montana Legislature enacted the BMP Notification Law (76-13-101 MCA), which requires private landowners to notify DNRC prior to harvesting timber. DNRC then provides information and technical assistance on how to apply BMPs in the logging operation. Under this law, forestry BMP information is sent to landowners. Implementation of Forestry BMPs is administered within a non-regulatory framework.

Since October 1991 the Streamside Management Zone (SMZ) Law (77-5-301 307 MCA) has regulated forest practices along streams. This law prohibits certain forest practices along stream channels and directs suitable streamside management practices. The SMZ Rules (36.11.301 - 310 ARM) became effective March 15, 1993 and were intended to help define and clarify the SMZ law. The 1992 BMP field reviews did not evaluate compliance with the SMZ law because most operations reviewed were completed prior to the effective date of the rules. Beginning in 1994, the field reviews were designed to provide information on the application and implementation of the SMZ law and rules, using a supplemental SMZ questionnaire. In 1998 the format and five-point scale used to evaluate the BMPs for application and effectiveness was adopted for evaluating application and effectiveness of the SMZ law and rules.

The BMP field review process, which the EPA calls BMP implementation monitoring, is a widely used means of evaluating forest practices. Implementation monitoring is an acceptable surrogate for water quality monitoring, a more quantitative, time consuming and expensive approach. Water quality varies naturally due to variable geology, landforms, soils, and climatic events. Due to this variability, investigators have to collect large numbers of samples over a long period of time to accurately characterize water quality.

In Montana investigators use qualitative implementation field reviews to find out if BMPs are being applied and whether they are controlling erosion. Since BMPs are recognized by state and federal legislation as a method to control non-point source pollution, it makes sense to check the application and effectiveness of BMPs as part of such a program. States are increasingly relying on qualitative surveys, using interdisciplinary teams to assess forest practices on-site to monitor their silvicultural non-point source control programs (NCASI, 1988). California, Idaho, Oregon, Utah, Minnesota, Washington, South Carolina, Texas, and Florida all use a similar qualitative approach to assess the control of non-point source pollution from forest practices.

Montana, through the DNRC, has appointed a technical work group that has overseen the BMP process since its inception and provides recommendations to DNRC. The work group members represent a broad range of interests in forestry in Montana. Several members also serve on the field review teams, and several have been involved with the program since 1988.

METHODS

Objectives

BMP field reviews have been conducted every two years beginning in 1990; 2012 represents the twelfth cycle. The 2012 field reviews were conducted with identical objectives and criteria as the previous field reviews in order to produce comparable results.

In 2012, the objectives of the BMP field reviews were to:

1. Determine if BMPs are being applied on timber harvest operations.

2. Evaluate the general effectiveness of BMPs in protecting soil and water resources.

3. Provide information on the implementation of the SMZ law and rules and assess general effectiveness of SMZs in protecting water quality.

4. Provide information to focus future educational or study efforts by identifying subjects and geographic areas in need of further attention or investigation.

5. Provide information on the need to revise, clarify, or strengthen BMPs.

The Study Area

The State of Montana is the study area. For 2012 the state was divided into three geographical regions, Northwest, West, and Central/Eastern. For administrative ease, the regional breaks are located along county lines.

Sample Size and Distribution

Historically the target for the number of sites to be reviewed was set at 45. This number was based on the interaction between the number of days the volunteer field review team members could be expected to commit to the review process and the number of field reviews a team could reasonably conduct in one day. The maximum time commitment for field review team members was established at 10 days. This is for all review-related activities, which includes calibration training, conducting the on-the-ground field reviews and a post-field season workshop. It was determined that a request exceeding 10 days would likely jeopardize the ability of individuals to participate, thus restricting the ability to field the desired number of fully-staffed teams. A field review team can be expected to complete one or two reviews per day depending on the regional distribution of sites and the travel time between sites. Based on the above expectations and assumptions, the target number was set at 45.

The targeted 45 field review sites are distributed across the state by geographical region (see Study Area above) and land ownership group. The field review process recognizes four ownership groups: State of Montana Trust Lands (DNRC), U.S. Forest Service/Bureau of Land Management lands (Federal), private industrial forest lands (Industry) and non-industrial private forest lands (NIPF). The basis for field review site distribution is the proportion of the total

statewide harvest volume that is harvested within each region by each ownership group. The 45 sites are allocated proportionally among the regions. Harvest volumes were obtained from the 2011 State of Montana Cut By County Report and USFS, BLM and DNRC annual harvest volume records.

A total of 42 sites were reviewed during the 2012 BMP cycle (see Table 1 for historical site information). Forty-one of the original selected sites participated in the field review process. One substitution was added. One site was dropped late in the process when it was discovered that it did not meet the minimum harvested acres requirement and two others were dropped when it was discovered that they were not completely finished/closed.

In general, it still is difficult to obtain the desired number of NIPF field review sites. Fewer NIPF sites are meeting the minimum and higher priority criteria (see Site Selection discussion below for criteria details). There is a continuing reduction in the number of NIPF landowners constructing roads and installing stream-crossing culverts. This trend can impact the number of NIPF sites that meet the minimum criteria.

The 42 sites are a representative sample of logging operations conducted in Montana since 2010 **that meet specific selection criteria** (see Site Selection, below). The selection criteria restrict the sample to those sites where on-the-ground timber harvest and timber management-related activities have the opportunity to impact water quality.

Table 1
Historical Number of Sites Reviewed by Ownership Group

Ownership Group	2012	2010	2008	2006	2004	2002	2000	1998	1996	1994	1992	1990
DNRC	6	6	6	5	4	5	5	5	5	5	5	5
Federal	13	16	8	5	9	5	9	12	12	14	16	16
Industrial	12	15	17	22	19	21	18	18	14	14	16	16
NIPF	11	8	11	12	7	12	10	12	13	13	9	7
Total	42	45	42	44	39	43	42	47	44	46	46	44

See Appendix B for the list of reviewed sites.

Site Selection

In January of 2012 the DNRC forestry assistance Bureau sent Industry, Federal and DNRC ownership group representatives a letter requesting potential BMP field review candidate sites. Each letter included a BMP Field Review Site Information Form (see Appendix D) to be completed for each harvest operation that met the first tier or minimum selection criteria (see page 7). As with past information requests, these ownership groups were very cooperative and provided essential information to DNRC. To obtain potential field review site information for NIPF ownership, DNRC searched its Hazard Reduction Agreements database and sent out letters to NIPF landowners of qualified sites asking if they would participate in the field review process.

A postcard was included in the mailing for returning a response or responses could be emailed or phoned in.

The following two pages outline the new selection criteria as it was used to determine eligibility. These criteria conform to a legislative audit of the procedure that was completed in 2008.

Minimum Criteria

- Sites harvested within two years prior to the field review (2010 and 2011).
- Minimum harvest size is 5 acres.
- Minimum size and volume per acre:
    - west-side sites – 3,000 or more board feet per acre removed
    - east-side sites – 1,500 or more board feet per acre removed

A portion of the sale must be located within 200 feet of a stream ***or*** have at least one Class I or II stream crossing on the road system associated with the harvest (access route and/or haul route) located on the ownership group's property within the field review project area ***or*** stream crossings are located on road for which the ownership group being reviewed had some maintenance responsibility that was associated with the harvest/sale that is being reviewed.

This is essentially privately owned roads (could have public on them though such as USFS roads) accessing the sale or harvest area that is being reviewed, no county or state roads.

Prioritization Criteria – each site submitted would be given points based on the following matrix and the points for each site totaled.

Explanation: Relative Risk Rating – this was developed as a more equitable and trackable approach to identifying higher risk sites. Each site's criteria would be assigned a point value – the more total points the higher the risk.

• Multiple new or replacement class 1 or 2 stream crossings	5 points
• Single new or replaced Class 1 or 2 stream crossing	4 points
• New road construction	3 points
• Reconstruction	2 points
• SMZ Harvest	2 points
• Existing stream crossings	1 point

a. For the purposes of assigning risk - all stream crossings are class I & II only. Class 3 streams are not considered for risk factors but would be taken into account on the ground.

b. The only stream crossings considered in determining risk are the stream crossings on the landowner's property.

Note: new or replaced stream crossings must have been implemented in association with the harvest project within 5 years of the review year.

Streams

Stream and Streamside Management Zone (SMZ): Definitions are from the Montana SMZ Administrative Rules; 36.11.301 2006 version).

For the purpose of BMP field reviews an SMZ must have an associated stream as defined in the SMZ law.

Definition of a Stream - A feature with a defined channel, definite banks or a sandy or rocky bottom, and flows water either intermittently or continuously.
Class 1 Stream – Any stream with fish. OR Any stream that flows for more than 6 months per year and flows into another stream, lake or other body of water.
Class 3 Stream – Does not have fish. Flows less than 6 months per year and does not flow into another stream, lake or other body of water.
Class 2 Stream - All streams that do not meet the definitions for Class 1 or Class 3 streams.

Roads

New Construction – Any roads constructed after January 1, 2007 used to access associated harvest areas.

Reconstruction – Reconstructing an existing road to a different set of design standards, such as widening roads, altering cut or fill slopes, culvert installation and/or replacement. For the purpose of field reviews, road work consisting of the installation of road drainage features and/or general road maintenance with no other reconstruction activities should not be submitted as "reconstruction".

An associated site selection issue is that of access to potential field review sites. BMP field reviews are voluntary, and thus permission to access a site must be granted by the landowner group or, in the case of NIPF lands, the individual landowner. The DNRC, Federal and Industry ownership groups have all agreed to unrestricted access to BMP field review sites, and access is not an issue. In the case of non-industrial private land, DNRC must obtain permission from each individual landowner prior to conducting the field review on their property. In order to accomplish this, DNRC made contact by initial mailing containing a letter, a brochure explaining the process and a pre-paid post card to return to DNRC notifying us if they agree to participate or decline. After selection a follow-up notification and/or telephone call to confirm permission and access to field review their property was made. If permission and access was confirmed, a follow-up call was made by the team leader to finalize the field review date. Landowners were encouraged to attend.

The sample size and sites selected DO NOT represent a sample of all timber harvest operations in Montana - ONLY those meeting site selection criteria. The selected sites are those where timber harvest is located in proximity to streams and therefore has the greatest potential for non-point source pollution to occur.

Table 2
Percentage of Sites With High Risk Criteria

Ownership Group	Number of Sites	Number of High Risk Sites	Percentage of High Risk Sites	Number of Sites With SMZ Harvest	Percentage of Sites With SMZ Harvest
DNRC	6	3	50%	2	33%
Federal	13	6	46%	2	15%
Industry	12	1	8%	10	83%
NIPF	11	1	9%	6	55%
All Sites	42	11	26%	20	48%

High Risk Sites

The goal of the field review process is to have approximately 2/3 of the reviewed sites classify as high risk. In 2012 only 26% of the sites reviewed met the high risk rating. There are several factors involved: 1) Substantially fewer timber sales met the initial qualifying criteria; 2) Due in large part to the recession, few private ownerships built roads and fewer yet spent the funds to install large pipes/bridges on their lands, in fact large installations/investments of any type were often deliberately avoided; 3) The Forest Service does very little harvest within the SMZ. Sales were designed to minimize expenses and generally when this is done a sale will rarely meet high risk criteria.

The Field Review Teams

Three field review teams were formed to conduct the 2012 field reviews--one for the northwestern, one for the western, and one for the central/eastern part of the state. These teams were typically composed of seven members--a fisheries biologist, a forester, a hydrologist, a conservation group representative, a road engineer, a soil scientist, and a shared position of logging professional or non-industrial private forest landowners. A member of each field review team was assigned to lead the team. The team leader was responsible for providing general in-the-field leadership and direction, contacting landowners, filling out the official rating form and coordinating the logistics of the team. Team members were employees of federal and state agencies, private industry, conservation organizations, independent consultants, and volunteers.

One training session was conducted prior to the actual field reviews. This session served as a refresher for those with previous experience and as a calibration for new and old team members. All team members, including alternates, were strongly encouraged to attend. The goal was to have the field review teams establish a consistent method of rating BMPs that would carry through the field review process. Team members and alternates met for several hours of classroom instruction on the BMP field review process and then evaluated a sample field review site in the field looking at specific flagged stations with specific issues. Team members shared their results and identified and discussed differences and ways to improve overall consistency. See Appendix D for a complete list of team members.

The Rating Form

The 2012 field review teams used a rating form identical to that of previous review cycles. The field review teams evaluated a maximum of 49 BMP practices and 11 SMZ practices at each site. The rating of application and effectiveness for each was done on a five-point scale, as in the past. See Appendix E for a copy of the rating form.

Application: The field review team rated the application of BMPs by first noting if the BMP was applicable to the site and, if so, whether it was applied to the correct technical standard, at the correct frequency, and in the proper locations. The field review teams utilize a decision tree (See Appendix H) to help rate application and effectiveness and consistency.

The lack of adequate or proper application is a BMP departure. The rating guide for BMP application is:

5 - Operation exceeds requirements of BMP.
4 - Operation meets requirements of BMP.
3 - Minor departure from intent of BMP.
2 - Major departure from intent of BMP.
1 - Gross neglect of BMP.

The following description of the rating guide is adapted from Ehinger & Potts, 1990. The 4 rating is self-explanatory. The 3 rating, minor departure, applies to departures of small magnitude distributed over a localized area, or over a larger area where potential for impact is low. The 2 rating, major departure, applies to departures of large magnitude or to BMPs being repeatedly neglected. The 1 rating, gross neglect, applies where risks to soil and water resources were obvious, yet there was no evidence indicating that operators had applied BMPs to protect these resources.

A "5" for Application is defined by Potts and Ehinger as "Improved protection of soil and water resources over pre-project conditions." Thus, if a BMP is applied adequately and its application leads to improved protection over pre-project conditions, the application rating for that practice would be a "5." In actuality the Montana field review rating policy does not exactly follow the Potts and Ehinger definition. It was decided that if a BMP practice was applied in such a way that the requirements of the BMP were met, regardless of improvement over pre-existing conditions, this would provide adequate protection and thus receive an application rating of "4."

Effectiveness: The effectiveness rating addresses how well the application of the applied BMP performed at limiting resource impacts and keeping soil out of water. This rating answers questions concerning impacts; for example, "Has the application or misapplication of a particular forest practice increased the likelihood of, or actual occurrence of, sediment delivery to streams?" The lack of "effectiveness" results in impacts.

The rating guide for effectiveness was:

5 - Improved protection of soil and water resources over pre-project condition.
4 - Adequate protection of soil and water resources.
3 - Minor and temporary impacts on soil and water resources.
2 - Major and temporary, or minor and prolonged, impacts on soil and water resources.
1 - Major and prolonged impacts on soil and water resources.

The BMP Working Group defined these terms prior to the 1990 field reviews to help the field teams use them consistently:

Adequate--Small amounts of material eroded; material does not reach draws, channels, or floodplain.
Minor--Some material erodes and is delivered to draws, but not to stream.
Major--Material erodes and is delivered to stream or annual floodplain.
Temporary--Impacts lasting one year or less; no more than one runoff season.
Prolonged--Impacts lasting more than one year.

Effectiveness ratings of "5" follow the same methodology as for Application. The effectiveness of the applied BMP exceeds what would be necessary to adequately protect soil and water resources. Effectiveness ratings of "5" are in fact only given if the protection provided is extraordinary or more than adequate; for example, installing a bridge for fish passage when a CMP would have met the BMP requirement or obliterating an unnecessary road rather than merely putting in road drainage or gating the road.

Occasionally a BMP did not apply on a site. In some cases the particular activity did not occur or was not complete, in others, the field review team could not rate the BMP at the time of the review - BMPs having to do with timing of operations during the harvest cannot be judged post-harvest. When these situations occurred, the team noted on the form that the practice did not apply and no rating was given. In 2012, a maximum of 2,058 practices (42 sites, 49 BMPs) could have been rated. Sixty-four percent of all possible BMP's were rated (1,309 of 2,058). Seventy-two percent of all possible SMZ practices were rated (334 of 462).

In addition to the 49 BMPs evaluated, the field review form contains two general questions in Section VII (Appendix E) addressed by the field review team. One question addresses the issue of overall reductions in sediment delivery to streams as a result of road improvements to existing road systems. The second addresses the third-party road system. These are discussed later in this report. These questions were answered for all sites.

Field Review Site Inspections

The teams conducted the field reviews from late June through late August of 2012. The field routine consists of team members, landowner representatives and observers meeting at a central location prior to each review. Teams and observers then travel to the field review site. When in the general area of the site, but before actually entering the road system to access the harvest area or the harvest area itself, there is a stop to discuss the specifics of the field review process. The team leader provides maps and field review forms. Usually the landowner/logger, or a representative of either the landowner/logger, briefs the team by giving background information on the silvicultural prescription, time of operation, and associated practices. All decisions regarding which roads, SMZs, new culvert installations and harvest units to be reviewed are determined before the team enters the subject road system or harvest area. Once on site, all team members walk the site as a group, and review BMP practices conducted in the selected areas. Teams typically spend about two hours inspecting, discussing, and then rating each site. Observers attending the field review may give feedback when requested, but are not allowed to participate in the ratings determination process or to lobby for a particular rating.

Limitations of the Field Review Methods

In analyzing field review results, readers need to consider the limitations of the techniques used in the field review. The review technique consists of a one-time field inspection and assessment. This approach documents erosion and sedimentation problems occurring in the first two years after harvest. This is generally the critical period for erosion associated with timber harvests. Some practices conducted during harvest cannot easily be evaluated during a post-harvest field review and are not considered during the field review. The assessment is based on visual appraisals of practices and impacts to surface soils and streams. The results are a "snapshot in time" of the practices and subsequent impacts. They do not necessarily reflect future impacts. During the 1998 field reviews, sites previously reviewed in 1996 and 1994–i.e., four- to six-year-old sites–were examined for long-term impacts. This information can be found in the 1998 Forestry BMP Audit Report (Fortunate et. al.)

Sites are split among the three teams. Although rating inconsistency between teams should not be overlooked, its effect is likely minor due to the interaction between teams and the continuity of experienced team members. DNRC monitors each team to evaluate and promote consistency.

RESULTS

This section presents the results of the 2012 BMP field reviews. Results will be presented in four parts: BMP Application, BMP Effectiveness, High Risk BMPs, and SMZ Results.

Results are also in three formats: summary data for BMP practices (Tables 3 and 6), summary data for reviewed sites (Tables 4 and 7), and a listing of the specific BMPs that incurred departures and impacts (Tables 5 and 8). For reference, Appendix H presents a summary tabulation of ratings by individual BMP.

Application of BMPs

The application rating measures whether the BMP was applied and whether it was applied to the correct standards the appropriate number of times and in the proper locations. See also "The Rating Form" section on page 9. Field review teams rated a total of 1,309 practices to assess how landowners and operators applied BMPs. Tables 3, 4 and 5 present results relevant to BMP Application.

Table 3
Application of BMPs to All Rated Practices by Ownership Group and Rating Category

		Percentage (%) of Practices Rated As			
Ownership Group	**# Practices Rated**	**Meet or Exceed**	**Minor Departures**	**Major Departures**	**Gross Neglect**
DNRC	224	98.7%	1.3%	0%	0%
Federal	459	97.2%	2.6%	0.2%	0%
Industrial	353	98.3%	1.5%	0.2%	0%
NIPF	273	96.4%	2.9%	0.7%	0%
All Sites	1,309	97.6%	2.1%	0.3%	0%

Practices were applied correctly 98% of the time (Table 3). In terms of departures, of the 1,309 practices evaluated, about 2.4% of the practices had departures; 28 ratings of 3 (**minor departures**) and 4 ratings of 2 (**major departures**). There were no ratings of 1 (**gross neglect**).

Table 4 details the **percentage of sites with application departures** and average number of departures per site. It shows that 38% of sites reviewed had **minor departures** which give an overall average of 0.67 departures per site. Seven percent of all sites were producing **major departures** which give an overall average of 0.95 departures per site. Sixty-two percent of sites had **no departures**.

Table 4
Field Review Sites with Departures from BMP Application with the Average Number of Departures per Site

		Percentage of Sites w/out Departures	Percentage (%) of Sites with Departures			Average Number of Departures Per Site*		
Ownership Group	**Total # of Sites**	**Adequate or Improved Protection**	**Minor**	**Major**	**Gross**	**Minor**	**Major**	**Gross**
DNRC	6	83%	17%	0%	0%	0.50	0.00	0.00
Federal	13	46%	46%	8%	0%	0.92	0.08	0.00
Industrial	12	67%	33%	8%	0%	0.42	0.08	0.00
NIPF	11	55%	45%	18%	0%	0.73	0.18	0.00
All Sites	42	62%	47%	4%	0%	0.67	0.10	0.00

*** Number of Departures/Total Number of Sites**

In Table 4, each category of departures must be considered separately, since a site may have departures in more than one category.

Table 5 identifies the specific BMPs where departures occurred. The list is ordered from most to fewest departures.

Table 5
Individual BMP Practices* Where Application Departures Occurred with number of Departure Ratings Given

SECTION	BMP SUBSECTION	BMP	2 Rating Departures	3 Rating Departures	Total Departures
III	E	2	0	8	8
III	C	1	2	5	7
V	D	1	0	4	4
III	E	1	1	1	2
III	C	3	0	2	2
III	C	7	1	0	1
III	C	2	0	1	1
III	D	5	0	1	1
III	E	6	0	1	1
IV	B	2	0	1	1
IV	B	5	0	1	1
IV	C	2	0	1	1
IV	C	8	0	1	1
V	C	2	0	1	1
TOTALS			**4**	**28**	**32**

* See Appendix A for a description of individual BMPs.

Effectiveness of BMPs

The effectiveness rating evaluates how well BMPs protected soil and water resources. See page 10 for further explanation of the effectiveness rating. The field review teams evaluated a total of 1,309 practices for effectiveness. Table 6 provides a summary of the effectiveness of all practices reviewed by ownership group.

Adequate protection was provided 99% of the time. In terms of impacts (Table 7), of 1,309 practices evaluated, 16 practices had impacts; 6 ratings of 3 (**minor temporary** impacts), 10 ratings of 2 (**major temporary or minor prolonged** impacts), and zero ratings of 1 (**major and prolonged** impacts).

Table 6
Effectiveness of BMPs for All Rated Practices by Ownership Group and Rating Category

Ownership Group	Number of Practices Rated	Percentage (%) of Practices Rated As			
		Adequate Protection	Minor/Temp. Impacts	Major/Temp. Minor/ Prolonged	Major/ Prolonged
DNRC	224	99.6%	0.4%	0%	0%
Federal	459	97.8%	0.9%	1.3%	0%
Industrial	353	99.4%	0.3%	0.3%	0%
NIPF	273	98.9%	0%	1.1%	0%
All Sites	1,309	98.8%	0.4%	0.8%	0%

Table 7 lists the percentage of sites with impacts and average number of impacts per site. The table shows that 12% of the sites reviewed had a total of six **minor/temporary** impacts which gives an overall average of 0.14 departures per site. Twelve percent (12%) of all sites had a total of 10 **major/temporary** impacts which gives an overall average of 0.24 departures per site.

Table 7
Field Review Sites with Impacts (BMP Effectiveness) and the Average Number of Impacts per Site

		Percentage (%) of Sites w/out Impacts	Percentage (%) of Sites With Impacts			Average Number of Impacts per Site*		
Ownership Group	Total # of Sites	Adequate or Improved Protection	Minor/ Temp.	Major/Temp. Minor/ Prolonged	Major/ Prolonged	Minor / Temp.	Major/Temp. Minor/ Prolonged	Major/ Prolonged
DNRC	6	83%	17%	0%	0%	0.17	0.0	0.0
Federal	13	62%	23%	15%	0%	0.31	0.46	0.0
Industrial	12	92%	8%	8%	0%	0.08	0.08	0.0
NIPF	11	82%	0%	18%	0%	0.0	0.27	0.0
All Sites	42	69%	16%	13%	4%	0.14	0.24	0.0

* Number of Impacts/Total Number of Sites

Table 8 identifies the specific BMPs where impacts occurred. The list is ordered from most to fewest departures.

Table 8
Individual BMP Practices* Where Effectiveness Impacts Occurred With the Number of Departure Ratings Given

Section	BMP Subsection	BMP	1 Rating	2 Rating	3 Rating	Total Effects Impacts
III	C	1	0	4	1	5
III	E	2	0	2	3	5
V	D	1	0	2	1	3
III	C	7	0	1	0	1
III	E	1	0	1	0	1
V	C	2	0	0	1	1
TOTALS			**0**	**10**	**6**	**16**

*See Appendix A for a description of individual BMPs.

Table 9 provides an overall numeric summary by ownership group of all departures and impacts.

Table 9
Overall Summary of Reviewed BMP Practices

Practices Information					Application			
Group	**Reviewed Sites**	**Total Practices Possible ***	**Number Practices Not Rated ****	**Number Practices Rated**	**Exceeds (5)**	**Minor (3)**	**Major (2)**	**Gross Neglect (1)**
DNRC	6	294	70	224	0	3	0	0
Federal	13	637	178	459	6	12	1	0
Industry	12	588	235	353	2	5	1	0
NIPF	11	539	266	273	1	8	2	0
Total	**42**	**2,058**	**749**	**1,309**	**9**	**28**	**4**	**0**

Effectiveness				
Group	**Exceeds (5)**	**Minor/ Temp (3)**	**Major/Temp Minor/Prolonged (2)**	**Major Prolonged (1)**
DNRC	0	1	0	0
Federal	3	4	6	0
Industry	2	1	1	0
NIPF	0	0	3	0
Totals	**5**	**6**	**10**	**0**

* Total practices possible based on the number of field review sites for each ownership.
** Practices not rated because the practice did not apply to the site. For example there was no new culvert installation.

High Risk BMPs

Percentages alone will not give a clear picture of the application and effectiveness of Montana's forestry BMPs. Even a low percentage of misapplied BMPs can still result in major impacts. Additionally, all practices evaluated can affect water quality, but the magnitude of their potential impacts can vary greatly. For example, drainage from a skid trail half a mile from a stream may not have as direct an impact on water quality as providing adequate road surface drainage at a stream crossing. In an effort to gain insight regarding the practices with the higher potential to directly impact water quality, eight high risk BMPs have been identified and analyzed separately. They are among the most important for protecting Montana's watersheds. They include:

BMP Number	Practice Description
III.C.1	Provide adequate road surface drainage for all roads.
III.C.7	Route road drainage through adequate filtration zones before entering a stream.
III.D.2	Stabilize erodible soils (i.e., seeding, benching, mulching).
III.E.2	Maintain erosion control features (dips, ditches and culverts functional).
IV.A.5	Design and locate skid trails to avoid concentrating runoff.
IV.B.5	Adequate drainage for temporary roads, skid trails, fire lines.
IV.C.8	Limit water quality impacts of prescribed fire.
V.C.4	Prevent erosion of culvert and bridge fills (i.e., armor inlet and outlet).

The results for application and effectiveness of the eight high risk BMPs are presented in Tables 10 and 11. Table 12 shows a comparison between All BMPs and High Risk BMPs.

Table 10 shows the BMP application for the eight high risk BMPs. The percentage of practices with departures is higher for the high risk group (7% vs. 2%) than for all reviewed practices, as shown in Table 12**.**

Table 10
Application of High Risk BMPs
by Ownership Group and Rating Category

		Percent (%) Practices Rated As			
Ownership Group	**Number of Practices Rated**	**Adequate Application**	**Minor Departures**	**Major Departures**	**Gross Neglect**
DNRC	43	100%	0%	0%	0%
Federal	93	90%	9%	1%	0%
Industrial	77	95%	4%	1%	0%
NIPF	61	92%	7%	1%	0%
All Practices	274	93%	6%	1%	0%

Table 11 shows the effectiveness of the eight high risk BMPs. The percentage of practices with departures is higher for the high risk group (4% vs. 1%) than for all reviewed practices, as shown in Table 12.

Table 11
Effectiveness of High Risk BMPs
by Ownership Group and Rating Category

Ownership Group	Number of Practices Rated	Adequate Protection	Minor/Temp. Impacts	Major/Temp. Minor/ Prolonged	Major/ Prolonged
DNRC	43	100%	0%	0%	0%
Federal	93	98%	1%	1%	0%
Industrial	77	99%	0%	1%	0%
NIPF	61	98%	0%	2%	0%
All Practices	274	96%	1%	3%	0%

Table 12
BMP Application and Effectiveness - All vs. High Risk

Application				
BMPs	**Meet or Exceed**	**Minor Departure**	**Major Departure**	**Gross Neglect**
All	98%	2%	<1%	0%
High Risk	93%	1%	3%	0%
Effectiveness				
BMPs	**Meet or Exceed**	**Minor Departure**	**Major Departure**	**Gross Neglect**
All	99%	<1%	<1%	0%
High Risk	96%	1%	3%	0%

Streamside Management Zones

There is a different purpose in reviewing SMZ rules compared to BMP practices. They both are designed to protect water quality. However, conducting field reviews of SMZ law activities is a non-regulatory look at SMZ rules compliance, whereas BMPs are non-regulatory.

The SMZ rating form used in 2012 (last page of Appendix G) is almost identical to that used in the previous three field review cycles. This time we did not rate whether the SMZ boundary was properly marked. It has proven to be too difficult to determine when flagging or other measures were no longer useful as boundary markers, therefore the BMP Working Group decided to drop

this rating. As in past years, the entries were modified to accept application and effectiveness ratings with a maximum of 11 practices rated on each site. The practices rated were taken from the SMZ rules. The scoring was the same as the 49 BMP practices with a five-point rating scale. **As with the BMPs in general, these ratings did not constitute an investigation or a DNRC enforcement action, nor were they used as a basis for future enforcement actions**. Field review team members evaluated departures based on their best professional judgment.

The SMZ law and rules were applicable to 37 of the 45 field review sites. Harvest of trees or potential impacts from harvesting within or near riparian areas occurred on 37 of the 45 sites (Table 2). A total of 10 SMZ departures were noted on five of the sites. A total of 332 SMZ evaluations were made. SMZ rules were applied correctly 97% of the time. Of the 10 departures, 6 had minor impacts and 4 had major impacts (Table 15).

In the 2010 field review cycle a decision was made not to rate Practice 1b, SMZ properly marked. The general consensus from the teams was that this is very difficult to do accurately because ribbon lines are often torn down after a project is completed or they are torn down by cows, deer, or elk which seem to enjoy chewing on the ribbon. Also, some ribbon biodegrades before a field review may take place. Therefore, it was decided and approved by the BMP Working Group to drop this rating from the field review process.

Table 13
SMZ Departures by Ownership Group

Ownership Group	Number of Sites Evaluated					Number of Sites with Departures					Total Number of Departures				
	2012	2010	2008	2006	2004	2012	2010	2008	2006	2004	2012	2010	2008	2006	2004
DNRC	6	6	6	5	4	0	0	0	0	0	0	0	0	0	0
Federal	10	14	7	4	9	2	3	1	0	1	3	7	1	0	1
Industrial	12	12	17	20	19	2	1	3	4	3	2	2	10	7	3
NIPF	9	5	11	12	7	3	1	5	2	2	6	1	13	3	4
All Sites	37	37	41	41	39	7	5	9	6	6	11	10	24	10	8

Table 14 provides a summary and comparison of SMZ departures by practice.

Table 14
SMZ Application Departures by Practice

Practice	Number of Departures
Equipment Operation in SMZ	5
SMZ Width Maintained	3
Sidecasting Material into Stream	1
SMZ Tree Retention	1
Broadcast Burning in SMZ	1
TOTAL	**11**

Table 15 provides a summary of application departures and effects.

Table 15
Summary of SMZ Departures and Effects

Application			Effectiveness		
Number of Departures	**Minor Departures (3)**	**Major Departures (2)**	**Number of Impacts**	**Minor/Temp. (3)**	**Major/Temp Minor/Prolonged (2)**
11	8	3	3	1	2

SMZ effectiveness was very high, over 99% for all ownerships combined. Of the 334 SMZ evaluations, 323 provided adequate protection (4 rating); 8 impacts were Minor/Temporary (3 rating) and 3 impacts rated Major/Temporary or Minor/Prolonged (2 rating). There were no Major and Prolonged impacts (1 rating).

SMZ Width

In all but three cases, the SMZ width exceeded or met the requirements of the SMZ law. Departures occurred on three sites where width was generally maintained, but marked improperly at some points or in some areas.

DISCUSSION

Application Across All Ownerships

Ninety-eight percent (98%) of the practices rated were properly applied according to BMP standards (Table 3). This percentage represents a slight increase from the 2010 overall rating of 97%, which continues to maintain an extremely high level of compliance. This percentage demonstrates the strong commitment all ownership groups and the logging community have for properly applying BMPs and practicing sound forest management in general as well as along streams.

Effectiveness Across All Ownerships

Ninety-nine percent (99%) of all applied BMPs were shown to be effective in preventing sediments from reaching draws or streams. The low percentage was 98% on Federal lands with the DNRC, Industry, and NIPF all reaching the 99th percentile.

The most frequent departures and impacts were associated with road maintenance and road surface drainage. The following list ranks rated BMPs by the sum of departures and impacts. Practice III.C.1 is ranked #1 because it had more total departures and impacts than any other practice. Ties indicate BMPs with equal number of departures/impacts. See Appendix J for a listing of all BMPs where departures and impacts were recorded and the number of departures and impacts identified.

Table 16

BMPs Ranked by the Total Sum of Departures plus Impacts for Each Field Review Cycle

Practice #	BMP Description	2012	2010	2008	2006	2004	2002	2000	1998	1996	1994	1992	1990
III.C.1 *	Provide adequate road surface drainage for all roads	2	1	1	1	2	1	1	1	1	1	3	1
V.D.1	Culverts maintained to preserve hydrologic capacity	3	3	3	2	13	--	--	--	--	--	--	--
III.E.2 *	Maintain erosion control features (dips, ditches and culverts functional).	1	3	2	3	1	3	6	3	5	5	--	10
III.C.7 *	Route road drainage through adequate filtration zones before entering a stream	5	2	3	4	3	2	3	2	7	2	2	--
V.B.1b	Direct road drainage away from stream crossing site.		5	--	5	5	2	2	5	3	3	13	19
III.E.1	Grade roads as necessary to maintain drainage	4	--	--	6	16	--	--	--	--	--	--	--
IV.B.5*	Adequate drainage for skid trails	6	6	5	6	4	--	--	--	--	--	--	--
V.C.2	Stream crossing culverts conform to natural streambed and slope	5	--	--	6	--	--	--	--	--	--	--	--
IV.A.6.	Suitable location, size, and number of landings.		5	4	7	--	--	--	--	--	--	--	--
IV.A.5*	Design and locate skid trails to avoid concentrating runoff.		4	--	8	5	--	--	--	--	--	--	--
III.E.3	Avoid cutting the toe of cut slopes.		3	--	9	--	--	--	--	--	--	--	--
IV.B.4	Adequate drainage for landing.		5	4	--	--	--	--	--	--	--	--	--
III.C.3	Design of relief culverts.	5	6	6	--	--	--	--	--	--	--	--	--
III.D.2*	Stabilize Erodible Soils			6	--	--	--	--	--	--	--	--	--
V.C.4*	Prevent erosion from stream crossing culverts and bridges		3	--	--	--	--	--	--	--	--	--	--
III.D.5	Cut and fill slopes at stable angles	6	3	--	--	--	--	--	--	--	--	--	--
III.D.8	Waste material not entering stream		4	--	--	--	--	--	--	--	--	--	--
III.C.4	Install culverts at original gradient		6	--	--	--	--	--	--	--	--	--	--
III.C.5	Provide energy dissipaters at drainage structure outlets where needed		5	--	--	--	--	--	--	--	--	--	--
III.D.6	No woody debris in road fill		5	--	--	--	--	--	--	--	--	--	--
IV.B.2	Avoid operating equipment in isolated wetlands	6	6	--	--	--	--	--	--	--	--	--	--
III.C.2	Ephemeral draws – proper culvert design	6											
III.E.6	Avoid use of roads during wet periods and breakup	6											
IV.C.8	Limit water quality impact of prescribed fire	6											

* Indicates “High Risk” BMPs.

The top four BMPs on the above list account for 75 percent of all departures and impacts. It can also be seen from this listing that the noted impacts generally occur within the same BMPs cycle after cycle.

The practices listed above for 2012 accounted for 100% of all departures and 100% of all impacts. Of 49 practices rated, 36 had zero departures or impacts. Five of the eight high risk BMPs had at least one departure.

It is interesting to note that in 2002, there were 133 total departures and impacts; in 2004 there were 74; in 2006 it was 114, in 2008 we had 93, in 2010 there were 62, and in 2012 there were on 47. This is consistent and ongoing improvement.

Combining application and effectiveness, the 2012 field reviews rated a total of 2,618 practices for the 42 sites. There were a combined total of 47 ratings with a departure or impact. **A departure or an impact occurred on 1.8% of all practices rated.** See Appendix J for a ranked summary of all departures and impacts by BMP for the 2012 field reviews.

Comparisons with Previous Field Reviews

See Tables 17 and 18 for a comparison of overall field review results.

The 2012 reviews show a continuing improvement in results when compared to earlier years. There were slight decreases in a few categories. The changes were small and could reflect statistical variation.

Table 17
Comparison of 2012 BMP Field Review Findings with All Previous Results

Category	2012	2010	2008	2006	2004	2002	2000	1998	1996	1994	1992
Application of practices that meet or exceed BMP requirements.	98%	97%	97%	96%	97%	96%	96%	94%	92%	91%	87%
Application of high risk practices that meet or exceed BMP requirements.	93%	93%	90%	89%	89%	90%	92%	84%	81%	79%	72%
Number of sites with at least one major departure in BMP application.	3 of 42 (7%)	5 of 45 (11%)	8 of 42 (19%)	4 of 44 (9%)	5 of 39 (13%)	10 of 43 (23%)	4 of 42 (10%)	8 of 47 (17%)	12 of 44 (27%)	17 of 46 (37%)	20 of 46 (43%)
Average number of departures in BMP application, per site.	0.76	0.87	1.19	1.52	1.30	1.80	1.40	2.00	3.00	3.90	5.60
Percentage of practices providing adequate protection.	99%	98%	97%	97%	99%	97%	98%	96%	94%	93%	90%
Percentage of high risk practices providing adequate protection.	96%	96%	91%	92%	95%	92%	93%	89%	86%	83%	77%
Number of sites having at least one major / temporary or minor / prolonged impact.	5 of 42 (12%)	7 of 45 (16%)	8 of 42 (19%)	7 of 44 (16%)	10 of 39 (25%)	15 of 43 (35%)	9 of 42 (21%)	12 of 47 (26%)	15 of 44 (34%)	13 of 46 (28%)	17 of 46 (37%)
Average number of impacts per site.	0.38	0.47	1.02	1.05	0.56	1.30	1.00	1.50	2.30	3.00	4.60

Results by Ownership Group

2012 field review results across all ownership groups were 93% or above for all BMP and SMZ categories (Table 19). Across all ownerships 3,286 ratings were made (2,618 BMP and 668 SMZ) with a total of 61 departures and impacts (47 BMP and 14 SMZ) for an overall compliance rating of 98%.

Given that all ownership groups demonstrated excellent overall compliance at the sites reviewed in 2012, there are some general observations that can be made for each. See Tables 9 and 19 and Appendix J for ownership comparison tables.

Table 18
Summarized Field Review Site Results 1990 Through 2012

		2012	2010	2008	2006	2004	2002	2000	1998	1996	1994	1992	1990
Application	Meets/Exceeds	97.6%	97%	96%	96%	97%	96%	96%	94%	92%	91%	87%	78%
	Minor Departures	2.1%	2%	4%	4%	3%	3%	3%	5%	7%	7%	8%	14%
	Major Departures	0.3%	<1%	<1%	<1%	<1%	1%	0.3%	1%	1%	3%	4%	8%
Effectiveness	Adequate Protection	99.8%	98%	97%	97%	99%	97%	98%	96%	94%	93%	90%	80%
	Minor Impacts	0.5%	<1%	2%	2%	<1%	1%	2%	3%	4%	5%	6%	11%
	Major Impacts	0.7%	2%	<1%	<1%	<1	2%	.07%	1%	2%	2%	4%	8%
% Sites	With Major Departures	7%	11%	19%	9%	13%	23%	10%	17%	27%	37%	43%	61%
	With Major Impacts	12%	16%	19%	16%	25%	35%	21%	26%	34%	28%	37%	64%
Average Departures	Minor Per Site	0.67	0.76	0.90	1.32	1.1	1.4	1.3	1.7	2.5	2.7	3.7	5.5
	Major Per Site	0.09	0.11	0.29	.20	0.26	0.39	0.12	0.34	0.55	1.1	1.4	2.5
Average Impacts	Minor Per Site	0.14	0.18	0.74	.66	0.26	0.58	0.71	1	1.6	2.1	2.8	4.4
	Major Per Site	0.24	0.29	0.29	.32	0.31	0.75	0.29	0.51	0.66	0.8	1.4	3.0

DNRC

All DNRC 2012 field review results were at 99% or above, equaling the 2010 results. Number of sites with departures dropped to one out of six. SMZ results remained the same at 100% for both Application and Effectiveness. For the high risk BMPs, Application "meets or exceeds" scores improved to 100%, up by 2% and Effectiveness "meets or exceeds" scores stayed strong at 100%.

Federal

In 2012 there were 13 federal sites, 11 were U.S. Forest Service and 2 were Bureau of Land Management. The federal scores were slightly improved with 97% or better. The Effectiveness score matched the 2010 level at 98% while Application improved slightly to 97%. SMZ Application improved from 94% from 97% and SMZ Effectiveness improved from 95% to 99%. For high risk BMPs, the Federal agencies increased their "meets or exceeds" scores from 87% to 90% for Application and slightly decreased them for Effectiveness from 92% to 91%.

Industry

Industry's 12 sites scored 98% for Application and 99% for Effectiveness of BMPs. This is identical to the 2010 Review and slightly below 2008. Industry showed a fractional decrease in SMZ Application with a score of 99% from 100% but SMZ Effectiveness gained fractionally from 98% to 2012's 99%. Industry was mixed on their "meets or exceeds" scores for high risk BMPs. Application stayed constant at while Effectiveness dropped from 99% to 97%.

Non-Industrial Private Forest Landowners (NIPF)

The 11 NIPF sites stayed relatively consistent in 2012 for their BMP/SMZ scores compared to previous reviews. Overall scores for BMP Application decreased from 98% to 96%, and BMP Effectiveness scores stayed constant at 99%. SMZ Application increased slightly from 92% to 93% and SMZ Effectiveness decreased slightly 99% and 100% compared to 2010 levels. For high risk BMPs, NIPF sites continued their strong showing but did decrease slightly for Application going from 96% to 92% and the Effectiveness score remained unchanged at 98%.

Table 19
Ownership Results Comparison 2012, 2010, and 2008

Practice	DNRC			Federal			Industry			NIPF			Totals		
	2012	2010	2008	2012	2010	2008	2012	2010	2008	2012	2010	2008	2012	2010	2008
BMP APPLICATION	99%	98%	98%	97%	96%	96%	98%	98%	99%	96%	98%	91%	98%	97%	97%
BMP EFFECTIVENESS	99%	99%	98%	98%	98%	96%	99%	99%	99%	99%	99%	92%	99%	98%	97%
SMZ APPLICATION	100%	100%	100%	97%	94%	99%	99%	100%	94%	93%	98%	89%	97%	97%	94%
SMZ EFFECTIVENESS	100%	100%	100%	99%	95%	99%	99%	98%	98%	99%	100%	92%	99%	98%	97%

Third Party Road and Other Use Implications

In 2012 Field Review Team Members still noted a range of water quality impacts not resulting directly from the sale being reviewed. Third party road impacts were observed at several field sites. Third party roads are roads not owned or directly controlled by the landowner being reviewed. Since the roads are not under the direct control of the participating landowner third party roads are not rated in the field review process. In order to qualitatively monitor BMPs associated with third party roads there is a location in Section VII of the field review form (Appendix E) where teams can record observations regarding third party roads. Several situations were noted where impacts were occurring because either roads were not adequately maintained by the road owner or roads were being used for another purpose, and that activity not related to the sale being reviewed was causing impacts.

Reductions in Overall Sediment Delivery

The question was asked as to how this could be evaluated and the results presented in the Field Review Report. The BMP Technical Working Group decided to add a new question to the BMP Field Review Form (Appendix E). The new question is in Section VII of the Field Review Form and reads, "Project included road improvements to existing road system that reduced overall sediment delivery to streams." The teams were asked to do a visual qualitative assessment of each reviewed project's post-project road system and, when possible, determine if improvements resulted in a reduction in sediment delivery to streams. The 2012 field review results for this question are provided in Table 20.

Table 20
Overall Sediment Reduction – Pre vs. Post Project Condition

Landowner	# Sites Reviewed	# Sites Applicable	Number Yes	Number No
DNRC	6	6	5	1
FEDERAL	13	13	7	6
INDUSTRY	12	12	2	10
NIPF	11	11	2	9
TOTALS	42	42	16	26

Results indicated 38% of the applicable sites reduced sediment delivery to streams from existing roads. This was compared to pre-project conditions. In these comparisons, an existing road system was in place prior to project commencement, and some sedimentation was occurring. During the course of the project, BMPs were implemented or brought up to current BMP standards such that sediment delivery to draws or streams was reduced. A "No" response indicated that there were no opportunities to reduce sediment on existing roads. Possible causes are that there were either no pre-existing roads or that BMPs had already been applied to the existing road system and were adequately functioning.

Existing roads are defined as road systems in place prior to commencement of activities on the sale being reviewed. This question did not apply to project areas where roads were not in place prior to commencement of activities.

A "Yes" determination does not necessarily mean that there was no sediment delivery occurring post-project. A "Yes" indicates that the post-operations status regarding delivery has been improved over the original conditions. Likewise, a "No" determination does not mean that conditions have worsened, nor that no improvements were made to the existing road system. A "No" indicates that any improvements made did not lead to reductions over pre-project conditions.

OTHER BMP ISSUES OF NOTE

Field Review Site Selection Process

During the 2007 Legislative Session the EQC directed the Legislative Audit Division (LAD) to initiate a performance audit of the Department of Natural Resources and Conservation Forest Practices Program. This audit focused primarily on the BMP audit process.

The performance audit provided one recommendation as follows:

"Recommendation #1: We recommend DNRC, in conjunction with the BMP Technical Working Group; expand BMP audit selection criteria prior to the 2008 BMP audit cycle to audit/monitor a broader spectrum of timber harvest sites."

Upon receipt of the performance audit results, DNRC responded with a request to move the implementation date to the 2010 field review cycle. This request was accepted.

The new selection criteria were implemented starting with the 2010 cycle site selections. They were used for 2012 as well. The criteria are shown below.

2012 Site Selection Criteria

Minimum Criteria – all commercial timber sale sites meeting these criteria must be submitted to DNRC.

- Timber Harvest must have occurred within 2 years of the field review year. The field review window can be extended to three years prior to the field review year by DNRC if necessary to yield a sufficient population for a given ownership category.

- A portion of the sale must be located within 200 feet of a stream ***or*** have at least one Class I or II stream crossing on the road system associated with the harvest located on the ownership group's property within the reviewed project area or stream crossings are located on sections of road that the reviewed party has a maintenance responsibility on the road system within the reviewed project area.
- Minimum harvest size 5 acres.
- Minimum harvest removal west side 3,000bf/acre, east side 1,500 bf/ac. The continental divide acts as the rough boundary between east and west.

Prioritization Criteria – each site submitted would be given points based on the following matrix and the points for each site totaled.

Multiple new or replacement class 1 or 2 stream crossings	5 points
Single new or replaced Class 1 or 2 stream crossing	4 points
New road construction	3 points
Reconstruction	2 points
SMZ Harvest	2 points
Existing stream crossings	1 point

Note: new or replaced stream crossings must have been implemented in association with the harvest project within 5 years of the review year.

Fish Passage BMPs

The BMP Working Group has created a matrix for measuring the effectiveness of newly installed Fish Passage culverts. The final process measures four separate parameters of the culvert installation. These are 1) The installation accommodates bankfull width (the mean high water level) of the stream; 2) The installation mimics the natural slope of the stream; 3) The installation retains substrates (gravels, cobbles, etc.) that are representative of the typical streambed for the stream in that location; and 4) the installation retains water depth through the culvert that is consistent with the surrounding stream.

These four criteria are assessed on a Less Favorable – More Favorable scale. An average 1 – 5 rating for the installation is developed based on these four ratings. This rating system was implemented on a trial basis during the 2008 and 2010 Field Review Cycles. This was to give the field review teams opportunities to familiarize themselves with the process and to evaluate whether the rating criteria were practical to implement. The feedback from the review teams is positive and these criteria will be used to measure new and replacement culvert installations that are associated with the reviewed timber sale.

This year three reviewed sites had culvert installations that qualified. Each site had one installation.

Table 21
Fish Passage Installation Ratings

Sale Number	Ownership	Application	Effectiveness
Fed - 2	BLM	4	4
Fed – 11	U S Forest Service	4	5
Fed - 14	U S Forest Service	5	5

CONCLUSIONS

This final section addresses the data collected and analyzed. Conclusions will address the objectives of the Best Management Practices field reviews as outlined on page five.

Determine if BMPs are being applied on timber harvest operations.

When considering sites meeting site selection criteria, it can be conclusively stated that BMPs are being applied correctly at a very high rate. This has been ongoing for several review cycles. Great care is taken to conceal the identity/location of field review sites in order to prevent activity that may alter the site from what it normally would have looked like. This has not been an issue but taking precautions will continue to ensure this. There were no sites reviewed where evidence of BMP application was not present. Informational handouts and local expertise from DNRC service foresters, consultants, loggers, MSU Extension forestry, and mill foresters have all contributed to improving BMP application rates. It is very reasonable to conclude that voluntary Forestry BMPs continue to be the strived for standard for timber harvest operations in Montana.

Evaluate the general effectiveness of BMPs in protecting soil and water resources.

Conclusions drawn from the field review results over the past 22 years are very straightforward and consistent; when BMPs are applied correctly, they very effectively protect soil and water resources. This combined with the efforts of many loggers, landowners, agencies, and mills to go above and beyond the standards to minimize sediments has kept overall results high and has brought real improvements on the ground, where it counts.

Provide information on the implementation of the SMZ law and rules and evaluate the general effectiveness of SMZs in protecting water quality.

The 2012 field review data once again shows that the SMZ law and rules are being effectively and consistently applied across the state. This coincides with what we see in DNRC's SMZ enforcement program. DNRC enforcement records show that SMZ law and rule violations across the state are generally few and that the impacts associated with these violations are generally minor and that they can be very effectively mitigated/repaired. As with previous review cycles, the 2012 field review data supports the contention that the SMZ law and rules are highly effective in protecting water quality and streamside habitat and structure during timber harvest operations.

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APPENDIX A

BEST MANAGEMENT PRACTICES FOR FORESTRY IN MONTANA
January 2006

* BMPs Not Monitored During Field Reviews

DEFINITIONS

1. "Hazardous or toxic material" means substances which by their nature are dangerous to handle or dispose of, or a potential environmental contaminant, and includes petroleum products, pesticides, herbicides, chemicals, and biological wastes.

2. "Stream," as defined in 77-5-302(7), MCA, means a natural water course of perceptible extent that has a generally sandy or rocky bottom or definite banks and that confines and conducts continuously or intermittently flowing water.

3. "Streamside Management Zone (SMZ)" or "zone" as defined at 77-5-302(8), MCA means "the stream, lake, or other body of water and an adjacent area of varying width where management practices that might affect wildlife habitat or water quality, fish, or other aquatic resources need to be modified." The streamside management zone encompasses a strip at least 50 feet wide on each side of a stream, lake, or other body of water, measured from the ordinary high water mark, and extends beyond the high water mark to include wetlands and areas that provide additional protection in zones with steep slopes or erosive soils.

4. "Wetlands" mean those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, swamps, bogs, and similar areas.

5. Adjacent wetlands are wetlands within or adjoining the SMZ boundary. They are regulated under the SMZ law.

6. Isolated wetlands lie within the area of operation, outside of the SMZ boundary, and are not regulated under the SMZ law.

II. STREAMSIDE MANAGEMENT

The Streamside Management Law (77-5-301 through 307 MCA) provides minimum regulatory standards for forest practices in streamside management zones (SMZ). The "Montana Guide to the Streamside Management Zone & Rules" is an excellent information source describing management opportunities and limitations within SMZs.

III. ROADS

A. Planning and Location

1. Minimize the number of roads constructed in a watershed through comprehensive road planning, recognizing intermingled ownership and foreseeable future uses. Use existing roads, unless use of such roads would cause or aggravate an erosion problem.

2. Review available information and consult with professionals as necessary to help identify erodible soils and unstable areas, and to locate appropriate road surface materials.*

3. Fit the road to the topography by locating roads on natural benches and following natural contours. Avoid long, steep road grades and narrow canyons.

4. Locate roads on stable geology, including well-drained soils and rock formations that tend to dip into the slope. Avoid slumps and slide-prone areas characterized by steep slopes, highly weathered bedrock, clay beds, concave slopes, hummocky topography, and rock layers that dip parallel to the slope. Avoid wet areas, including moisture-laden or unstable toe slopes, seeps, wetlands, wet meadows, and natural drainage channels.

5. Minimize the number of stream crossings and choose stable stream crossing sites.

6. Locate roads to provide access to suitable (relatively flat and well-drained) log landing areas to reduce soil disturbance.*

B. Design

1. Properly design roads and drainage facilities to prevent potential water quality problems from road construction.*

2. Design roads to the minimum standard necessary to accommodate anticipated use and equipment. The need for higher engineering standards can be alleviated through proper road-use management.

3. Design roads to balance cuts and fills or use full bench construction (no fill slope) where stable fill construction is not possible.*

4. Design roads to minimize disruption of natural drainage patterns. Vary road grades to reduce concentrated flow in road drainage ditches, culverts, and on fill slopes and road surfaces.

C. **Road Drainage.** Road Drainage is defined as all applied mechanisms for managing water in a non-stream crossing setting, road surface drainage, and overland flow; ditch relief, cross drains and drain dips)

1. Provide adequate drainage from the surface of all permanent and temporary roads. Use outsloped, insloped or crowned roads, and install proper drainage features. Space road drainage features so peak flow on road surfaces or in ditches will not exceed capacity.

    a. Outsloped roads provide a means of dispersing water in a low-energy flow from the road surface. Outsloped roads are appropriate when fill slopes are stable, drainage will not flow directly into stream channels, and transportation safety can be met.

    b. For in-sloped roads, plan ditch gradients steep enough, generally greater than 2% but less than 8%, to prevent sediment deposition and ditch erosion. The steeper gradients may be suitable for more stable soils; use the lower gradients for less stable soils.

    c. Design and install road surface drainage features at adequate spacing to control erosion; steeper gradients require more frequent drainage features. Properly constructed drain dips can be an economical method of road surface drainage. Construct drain dips deep enough into the subgrade so that traffic will not obliterate them.

2. Design all ephemeral draw culverts with adequate length to allow for road fill width. Minimum culvert size is 15 inch. Install culverts to prevent erosion of fill, seepage and failure as described in V.C.4 and maintain cover for culverts as described in V.C.6.

3. Design all relief culverts with adequate length to allow for road fill width. Protect the inflow end of all relief culverts from plugging and armor if in erodible soil. When necessary construct catch basins with stable side slopes. Unless water flows from two directions, skew ditch relief culverts 20 to 30 degrees toward the inflow from the ditch to help maintain proper function.

4. Where possible, install culverts at the gradient of the original ground slope; otherwise, armor outlets with rock or anchor downspouts to carry water safely across the fill slope.

5. Provide energy dissipaters (rock piles, slash, log chunks, etc.) where necessary to reduce erosion at outlet of drainage features. Crossdrains, culverts, water bars, dips, and other drainage structures should not discharge onto erodible soils or fill slopes without outfall protection.

6. Prevent downslope movement of sediment by using sediment catch basins, drop inlets, changes in road grade, headwalls, or recessed cut slopes.*

7. Route road drainage through adequate filtration zones or other sediment-settling structures to ensure sediment doesn't reach surface water. Install road drainage features above stream crossings to route discharge into filtration zones before entering a stream.

D. <u>Construction</u> (see also Section IV on stream crossings.)

1. Keep slope stabilization, erosion and sediment control work current with road construction. Install drainage features as part of the construction process, ensuring that drainage structures are fully functional. Complete or stabilize road sections within same operating season.*

2. Stabilize erodible, exposed soils by seeding, compacting, riprapping, benching, mulching, or other suitable means.

3. At the toe of potentially erodible fill slopes, particularly near stream channels, pile slash in a row parallel to the road to trap sediment (example, slash filter windrow). When done concurrently with road construction, this is one method that can effectively control sediment movement, and it can also provide an economical way of disposing of roadway slash. Limit the height, width and length of "slash filter windrows" so wildlife movement is not impeded. Sediment fabric fences or other methods may be used if effective.

4. Minimize earthmoving activities when soils appear excessively wet. Do not disturb roadside vegetation more than necessary to maintain slope stability and to serve traffic needs.*

5. Construct cut and fill slopes at stable angles to prevent sloughing and other subsequent erosion.

6. Avoid incorporating potentially unstable woody debris in the fill portion of the road prism. Where possible, leave existing rooted trees or shrubs at the toe of the fill slope to stabilize the fill.

7. Consider road surfacing to minimize erosion.*

8. Place debris, overburden, and other waste materials associated with construction and maintenance activities in a location to avoid entry into streams. Include these waste areas in soil stabilization planning for the road.

9. Minimize sediment production from borrow pits and gravel sources through proper location, development and reclamation.

10. When using existing roads, reconstruct only to the extent necessary to provide adequate drainage and safety; avoid disturbing stable road surfaces. Prior to reconstruction of existing roads within the SMZ, refer to the SMZ law. Consider abandoning existing roads when their use would aggravate erosion.

E. Maintenance

1. Grade road surfaces only as often as necessary to maintain a stable running surface and adequate surface drainage.

2. Maintain erosion control features through periodic inspection and maintenance, including cleaning dips and crossdrains, repairing ditches, marking culvert inlets to aid in location, and clearing debris from culverts.

3. Avoid cutting the toe of cut slopes when grading roads, pulling ditches, or plowing snow.

4. When plowing snow, provide breaks in snow berm to allow road drainage.*

5. Haul all excess material removed by maintenance operations to safe disposal sites and stabilize these sites to prevent erosion. Avoid sidecasting in locations where erosion will carry materials into a stream.*

6. Avoid using roads during wet periods if such use would likely damage the road drainage features. Consider gates, barricades or signs to limit use of roads during spring break up or other wet periods.

7. Upon completion of seasonal operations, ensure that drainage features are fully functional. The road surface should be crowned, outsloped, insloped, or water-barred. Remove berms from the outside edge where runoff is channeled.*

8. Leave abandoned roads in a condition that provides adequate drainage without further maintenance. Close these roads to traffic; reseed and/or scarify; and, if necessary, recontour and provide water bars or drain dips.

IV. TIMBER HARVESTING, AND SITE PREPARATION

A. Harvest Design

1. Plan timber harvest in consideration of your management objectives and the following*:

    a. Soils and erosion hazard identification.
    b. Rainfall.
    c. Topography.

d. Silvicultural objectives.
e. Critical components (aspect, water courses, landform, etc.).
f. Habitat types.
g. Potential effects on water quality and beneficial water uses.
h. Watershed condition and cumulative effects of multiple timber management activities on water yield and sediment production.
i. Wildlife habitat.

2. Use the logging system that best fits the topography, soil type, and season, while minimizing soil disturbance and economically accomplishing silvicultural objectives.

3. Use the economically feasible yarding system that will minimize road densities.*

4. Design and locate skid trails and skidding operations to minimize soil disturbance. Using designated skid trails is one means of limiting site disturbance and soil compaction. Consider the potential for erosion and possible alternative yarding systems prior to planning tractor skidding on steep or unstable slopes.*

5. Locate skid trails to avoid concentrating runoff and provide breaks in grade. Locate skid trails and landings away from natural drainage systems and divert runoff to stable areas. Limit the grade of constructed skid trails on geologically unstable, saturated, highly erosive, or easily compacted soils to a maximum of 30 percent. Use mitigating measures such as water bars and grass seeding to reduce erosion on skid trails.

6. Minimize the size and number of landings to accommodate safe, economical operation. Avoid locating landings that require skidding across drainage bottoms.

B. Other Harvesting Activities

1. Tractor skid where compaction, displacement, and erosion will be minimized. Avoid tractor or wheeled skidding on unstable, wet, or easily compacted soils and on slopes that exceed 40 percent unless operation can be conducted without causing excessive erosion. Avoid skidding with the blade lowered. Suspend leading ends of logs during skidding whenever possible.

2. Avoid operation of wheeled or tracked equipment within isolated wetlands, except when the ground is frozen (see Section VI on winter logging).

3. Use directional felling or alternative skidding systems for harvest operations in isolated wetlands.*

4. For each landing, provide and maintain a drainage system to control the dispersal of water and to prevent sediment from entering streams.

5. Ensure adequate drainage on skid trails to prevent erosion. On gentle slopes with slight disturbance, a light ground cover of slash, mulch or seed may be sufficient. Appropriate spacing between water bars is dependent on the soil type and slope of the skid trails. Timely implementation is important.

6. When existing vegetation is inadequate to prevent accelerated erosion, apply seed or construct water bars before the next growing season on skid trails, landings and fire trails. A light ground cover of slash or mulch will retard erosion.*

C. Slash Treatment and Site Preparation

1. Rapid reforestation of harvested areas is encouraged to reestablish protective vegetation.*

2. When treating slash, care should be taken to preserve the surface soil horizon by using appropriate techniques and equipment. Avoid use of dozers with angle blades.

3. Minimize or eliminate elongated exposure of soils up and down the slope during mechanical scarification.*

4. Scarify the soil only to the extent necessary to meet the resource management objectives. Some slash and small brush should be left to slow surface runoff, return soil nutrients, and provide shade for seedlings.

5. Carry out brush piling and scarification when soils are frozen or dry enough to minimize compaction and displacement.

6. Carry out scarification on steep slopes in a manner that minimizes erosion. Broadcast burning and/or herbicide application is preferred means for site preparation, especially on slopes greater than 40%.

7. Remove all logging machinery debris to proper disposal site.*

8. Limit water quality impacts of prescribed fire by constructing water bars in firelines; not placing slash in drainage features and avoiding intense fires unless needed to meet silvicultural goals. Avoid slash piles in the SMZ when using existing roads for landings.

V. STREAM CROSSINGS

A. Legal Requirements

1. Under the Natural Streambed and Land Preservation Act of 1975 (the "310 law"), any activity that would result in physical alteration or modification of a perennial stream, its bed or immediate banks must be approved in advance by the supervisors of the local conservation district. Permanent or temporary stream crossing structures, fords, riprapping or other bank stabilization measures, and culvert installations on perennial streams are some of the forestry-related projects subject to 310 permits.

   Before beginning such a project, the operator must submit a permit application to the conservation district indicating the location, description, and project plans. The evaluation generally includes on-site review, and the permitting process may take up to 60 days.

2. Stream-crossing projects initiated by federal, state or local agencies are subject to approval under the "124 permit" process (administered by the Department of Fish, Wildlife and Parks), rather than the 310 permit.

3. A short-term exemption (3a authorization) from water quality standards is necessary unless waived by the Department of Fish, Wildlife and Parks as a condition of a 310 or 124 permit. Contact the Department of Environmental Quality in Helena at 444-2406 for additional information.

B. Design Considerations (Note: 310 permit required for perennial streams)

1. Cross streams at right angles to the main channel if practical. Adjust the road grade to avoid the concentration of road drainage to stream crossings. Direct drainage flows away from the stream crossing site or into an adequate filter.

2. Avoid unimproved stream crossings. Depending on location, culverts, bridges and stable/reinforced fords may be used.

C. Installation of Stream Crossings (Note: 310 permit required for perennial streams.)

1. Minimize stream channel disturbances and related sediment problems during construction of road and installation of stream crossing structures. Do not place erodible material into stream channels. Remove stockpiled material from high water zones. Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance. Time construction activities to protect fisheries and water quality.

2. Design stream-crossings for adequate passage of fish (if present) with minimum impact on water quality._When using culverts to cross small streams, install those culverts to conform to the natural stream bed and slope on all perennial streams and on intermittent streams that support fish or that provides seasonal fish passage. Ensure fish movement is not impeded. Place culverts slightly below normal stream grade to avoid outfall barriers.

3. Do not alter stream channels upstream from culverts, unless necessary to protect fill or to prevent culvert blockage. On stream crossings, design for, at a minimum, the 25-year frequency runoff. Consider oversized pipe when debris loading may pose problems. Ensure sizing provides adequate length to allow for depth of road fill.

4. Install stream-crossing culverts to prevent erosion of fill. Compact the fill material to prevent seepage and failure. Armor the inlet and/or outlet with rock or other suitable material where feasible.

5. Consider dewatering stream crossing sites during culvert installation.*

6. Maintain a 1-foot minimum cover for stream-crossing culverts 15 to 36 inches in diameter, and a cover of one-third diameter for larger culverts, to prevent crushing by traffic.

7. Use culverts with a minimum diameter of 15 inches for permanent stream crossings.*

D. Existing Stream Crossing

1. Ensure stream crossing culverts have adequate length to allow for road fill width and are maintained to preserve their hydrologic capacity. To prevent erosion of fill, provide or maintain armoring at inlet and/or outlet with rock or other suitable material where feasible. Maintain fill over culvert as described in V.C. 6.

VI. Winter Logging

A. General

1. Consider snow-road construction and winter harvesting in isolated wetlands and other areas with high water tables or soil erosion and compaction hazards.*

2. Conduct winter logging operations when the ground is frozen or snow cover is adequate (generally more than one foot) to prevent rutting or displacement of soil. Be prepared to suspend operations if conditions change rapidly, and when the erosion hazard becomes high.*

3. Consult with operators experienced in winter logging techniques.*

B. Road Construction and Harvesting Considerations

1. For road systems across areas of poor bearing capacity, consider hauling only during frozen periods. During cold weather, plow any snow cover off of the roadway to facilitate deep freezing of the road grade prior to hauling.*

2. Before logging, mark existing culvert locations. During and after logging, make sure that all culverts and ditches are open and functional.*

3. Use compacted snow for road beds in unroaded, wet or sensitive sites. Construct snow roads for single-entry harvests or for temporary roads.*

4. In wet, unfrozen soil areas, use tractors or skidders to compact the snow for skid road locations only when adequate snow depth exists. Avoid steeper areas where frozen skid trails may be subject to erosion the next spring.*

5. Return the following summer and build erosion barriers on any trails that are steep enough to erode.*

VII. HAZARDOUS SUBSTANCES

A. General

1. Know and comply with regulations governing the storage, handling, application (including licensing of applicators), and disposal of hazardous substances. Follow all label instructions.

2. Develop a contingency plan for hazardous substance spills, including cleanup procedures and notification of the State Department of Environmental Quality.*

B. Pesticides and Herbicides

1. Use an integrated approach to weed and pest control, including manual, biological, mechanical, preventive and chemical means.*

2. To enhance effectiveness and prevent transport into streams, apply chemicals during appropriate weather conditions (generally calm and dry) and during the optimum time for control of the target pest or weed.*

APPENDIX B

2012 BMP FIELD REVIEWS
REVIEWED SITES BY OWNERSHIP GROUP

SITE #	SITE NAME	COUNTY	OWNER	FIELD REVIEW TEAM
STATE-1	Shorts Meadows/Evers Creek	Flathead	DNRC	Central/East
STATE-3	Two Trout	Sanders	DNRC	West
STATE-4	North Elliston	Powell	DNRC	West
STATE-5	Trout Creek Salvage	Granite	DNRC	West
STATE-6	Gambler's Secret	Granite	DNRC	West
FED-2	Price of Beans	Beaverhead	BLM	West
FED-3	Rat Creek	Beaverhead	USFS	Central/East
FED-4	Anaconda Job Corps	Deer Lodge	USFS	West
FED-5	Georgetown Sale	Granite	USFS	West
FED-6	Georgetown Sale	Granite	USFS	West
FED-7	Main Boulder fuels Reduction	Park, Sweetgrass	USFS	Central/East
FED-8	Clancy Unionville Salvage	Lewis & Clark, Jefferson	USFS	Central/East
FED-9	DROPPED	--	--	--
FED-10	Mid Swan Blowdown	Lake	USFS	Northwest
FED-11	Swaney Dun Salvage	Flathead	USFS	Northwest
FED-12	DROPPED	--	--	--
FED-13	Whitetail Salvage	Meagher	USFS	Central/East
FED-14	Jocko fire Salvage	Missoula	USFS	West
FED-15	Kerleebert	Ravalli	USFS	West
IND-1	Wolfbait Gordy	Lincoln	Stimson	Northwest
IND-2	Mistle Launch	Sanders	PCTC	West
IND-3	Big 29 Tractor CP	Sanders	PCTC	West
IND-4	Rand SMZ	Flathead	PCTC	Northwest
IND-5	Big Juan Exca-Line	Flathead	PCTC	Northwest
IND-6	Teepee Mech Tong	Lincoln	PCTC	Northwest
IND-7	Three Lines West	Lincoln	PCTC	Northwest
IND-8	Eli Line	Lincoln	PCTC	Northwest
IND-9	Hard Boiled	Sanders	PCTC	Northwest
IND-10	Brist Mech 2011	Flathead	Stoltze	Northwest
IND-11	O'Neil21 Ridgline	Flathead	Stoltze	Northwest
IND-12	North Stone Line	Gallatin	RY Timber	Central/East
NIPF-1	Private	Cascade	PVT	Central/East
NIPF-2	Private	Deer Lodge	PVT	West
NIPF-3	Private	Flathead	PVT	Northwest
NIPF-4	Private	Gallatin	PVT	Central/East
NIPF-5	Private	Gallatin	PVT	Central/East
NIPF-6	Private	Gallatin	PVT	Central/East
NIPF-7	Private	Lewis & Clark	PVT	Central/East
NIPF-8	Private	Missoula	PVT	West
NIPF-9	Private	Powell	PVT	West
NIPF-10	Private	Sanders	PVT	Northwest
NIPF-11	Private	Flathead	PVT	Northwest
NIPF-12	Private	Beaverhead	PVT	Central/East

APPENDIX C

BMP FIELD REVIEW SITE INFORMATION FORM ALL OWNERSHIPS

A) Please complete this sheet for each site that meets minimum criteria (see page 2 for instructions).
B) Please attach a sale area map for each site. Highlight or otherwise identify new road construction and/or reconstruction and Streamside Management Zones.
C) All references to streams and Streamside Management Zones (SMZ) are based on SMZ Law and 2006 Rules update, (see attached sheet).

Minimum Criteria

1) Timber harvested during **Calendar Years 2008 and 2009 and**
2) Some portion of the sale (cutting unit) is located within 200 feet of a stream or an access road crosses a class I or class II stream, **and**
3) Minimum size of 5 harvested acres with 3,000 BF/acre (westside), or 1,500 BF/acre (eastside) actually harvested. Continental divide determines east and west sides.

Sale Name _____

Landowner Type (circle one) Federal NIPF Industry State

Landowner Name _____ Phone # _____

MHRA Attachment Yes No MHRA Holder Name _____

HRA Agreement Number _____ County _____

HRA Holder Name _____ Phone # _____

Legal Description Section _____ TWN _____ RNG _____

Acres Harvested _____ Primary Drainage _____

New Road Construction (Since 2003) Yes No Miles _____

Road Reconstruction/Deconstruction Yes No Miles _____

Slash Disposal Complete Yes ___ No ___

Average MBF Volume/Acre Removed From Harvested Area _____MBF/Ac

New Stream Crossing Culvert Installation Yes No Number of crossings _____

Is new crossing on a fish bearing stream Yes No

Pre-Existing Stream Crossings On Access Road System Yes ___ No ___

Stream Within 200 Feet of a Harvest Unit Yes ____ No ____

Riparian (SMZ) Harvest Yes ____ No ____

Month/Year Harvest Conducted: From _____ To _____

Local Contact _____ Ph # _____

APPENDIX D

BMP FIELD REVIEWS TEAM MEMBERSHIP 2012 CYCLE

	NORTHWEST	WEST	CENTRAL / EAST
FISHERIES	Leo Rosenthal, DFWP + Mike Hensler, DFWP +	(Shane Hendrickson, USFS) + (Jim Bower, DNRC) +	Trevor Selch, DFWP +
HYDROLOGY	(Brian Sugden, PCTC) + **(Jeff Schmalenberg DNRC)** + Craig Kendall, USFS + (Tony Nelson, DNRC) +	**Gary Frank, DNRC +**	Mark Nienow, USFS + Wayne Green, USFS +
SOILS	Lou Kuennen, USFS + **Jeff Schmalenberg DNRC +** Derek Milner, USFS +	Wayne (Skip) Barndt +	Bob Logar NRCS +
FORESTRY	(Paul McKenzie, Stoltze) + (Dave Jones, DNRC) + Mark Boardman, Stoltze + Allen Branine, DNRC #	Steve Hayes, BBER + Neil Simpson, DNRC # Angela Mallon, DNRC # Henry Fassnacht, TNC # Chris Town, NRCS #	**Don Kasten, BIA +** (Steve Flynn, SML) + (Dwight Crawford, SML) + DJ Bakken, DNRC + Dave Krueger, SML #
ENGINEERING AND ROADS	(Vic Andersen, PCTC) + **Jeff Schmalenberg DNRC +** (Allen Branine, DNRC) #	Beth Dodson, U of M + Steve Hayes, BBER + Rex Anderson, SML # Chris Town, NRCS # **Gary Frank, DNRC +*** Henry Fassnacht, TNC #	Gordy Sanders, PML + (Steve Flynn, SML) # Rex Anderson, SML # (Dwight Crawford, SML) + DJ Bakken, DNRC +
CONSERVATION		(Robert Benson, CFC) + Henry Fassnacht, TNC # Harold Holden, CFC #	
NIPF/LOGGER		Debra Parker Foley, MFOA +	Doug Mote, Mote Lumber + Rex Anderson, SML +
OBSERVER			Don Senn, USFS Laura Andersen, DEQ

\+ Denotes Past Team Member Experience
\# Denotes New Team Member
( ) Denotes Alternate Team Member
Bold Lettering denotes a Team Leader

APPENDIX E

BMP FIELD REVIEW FORM

DS-49
Rev 1/04

BMP FIELD REVIEWS
SITE INFORMATION

Site Number: _____

Meets Selection Criteria: Y/N _____
High Hazard: Y/N _____: Riparian _____Matrix____

Site Name: _____

Owner(s): _____

Legal Description: _____ County: _____

Primary Drainage: _____ Month/Year Harvested: _____

Stream Within 200 Ft.? Y / N Name: _____ Bankfull Width: _____

Unit Size: _____ Volume Removed: _____

Road Construction: _____ Length: _____

Road Reconstruction: _____ Length: _____

Slash Disposal Complete: _____ Method: _____

Logging Method: _____

Slope: 0-5%_____; 5-20%_____; 20-40%_____; 40%+_____

Parent Material: _____

Soil Erodibility: High____ Medium____
Low____

Harvest in SMZ: Y / N

Stream Class: _____

Comments:

Rating Guide

APPLICATION
5—Operation Exceeds Requirements Of Bmp
4—Operation Meets Requirements Of Bmp
3—Minor Departure From Bmp
2—Major Departure From Bmp
1—Gross Neglect Of Bmp

EFFECTIVENESS
5—Improved Protection Of Soil And Water Resources Over Pre-Project Condition
4—Adequate Protection Of Soil And Water Resources
3—Minor And Temporary Impacts On Soil & Water Resources
2—Major And Temporary Or Minor And Prolonged Impacts On Soil And Water Resources.
1—Major And Prolonged Impacts On Soil And Water Resources.

DEFINITIONS (BY EXAMPLE)
Adequate—Small amount of material eroded;
Material does not reach draws, channels, or floodplain.
Minor—Erosion and delivery of material to draws but not stream.
Major—Erosion and subsequent delivery of sediment to stream or annual floodplain.
Temporary—Impacts lasting one year or less; no more than one runoff season.
Prolonged—Impacts lasting more than one year.

NR – Not Reviewed NA – Not Applicable

FIELD AUDIT

Date: _____

Team Leader/Recorder: _____
Team Members:

Observers Present:

MONTANA FOREST PRACTICES REVIEW WORKSHEET

BMPs Applicable to:

+ New Road Construction

Existing Roads

➢ Reconstruction

		RECOMMENDED BEST MANAGEMENT PRACTICES	APPLICABLE TO SITE (Y/N)	APPLICATION	EFFECTIVENESS	COMMENTS
SECTION III—ROADS						
		ROAD PLANNING & LOCATION SECTION III. A.				
➢+	1a.	Minimize number of roads necessary.				
#	1b.	Use existing roads unless aggravated erosion.				
+	3.	Avoid long, sustained, steep road grades.				
+	4.	Locations avoid high-hazard sites (i.e., wet areas and unstable slopes).				
+	5a.	Minimize number of stream crossings. Number _____.				
+	5b.	Choose stable stream crossing sites.				
		ROAD DESIGN SECTION III.B.				
➢+	2.	Design roads to minimum standard necessary to accommodate anticipated uses.				
+	4.	Vary road grade to reduce concentrated drainage.				
		ROAD DRAINAGE SECTION III. C.				
+➢#	1.	Provide adequate road surface drainage for all roads.				
+➢	2.	Design ephemeral draw culverts with adequate length and size and to prevent erosion of fill. Minimum size 15", maintain cover.				
+➢#	3.	Design all relief culverts with adequate length and appropriate skew. Protect inflow end from erosion. Catch basins where appropriate.				
+➢#	4.	Install culverts at original gradient, otherwise rock armour or anchor downspouts.				
+➢#	5.	Provide energy dissipaters at drainage structure outlets where needed.				
+➢#	7.	Route road drainage through adequate filtration zones before entering a stream.				

MONTANA FOREST PRACTICES REVIEW WORKSHEET
BMPs Applicable to:
+ New Road Construction
# Existing Roads
➢ Reconstruction

		CONSTRUCTION/RECONSTRUCTION SECTION III. D.				
+➢	2.	Stabilise erodible soils (i.e., seeding, benching, mulching).				
+➢	3.	Provide effective sediment control on erodible fill slopes (ex. Slash filter windrow).				
+➢	5.	Cut and fill slopes at stable angles. Slope ratio: _____.				
+➢	6.	Avoid incorporating woody debris in road fill.				
+➢	8.	Excess materials (waste) placed in locations that avoid entering stream.				
+➢	9.	Sediment from borrow pits and gravel pits minimized.				
➢	10.	Reconstruct only to the extent necessary to provide adequate drainage and safety.				
		ROAD MAINTENANCE SECTION III. E.				
+➢#	1.	Grade roads as necessary to maintain drainage.				
+➢#	2.	Maintain erosion control features (dips, ditches and culverts functional).				
#	3.	Avoid cutting the toe of cut slopes.				
+➢#	6.	Avoid use of roads during wet periods and spring breakup.				
+➢#	8.	Abandoned roads in condition to provided adequate drainage without further maintenance.				
SECTION IV – TIMBER HARVESTING						
		HARVEST DESIGN SECTION IV. A.				
	2.	Suitable logging system for topography, soil type and season of operation.				
	5.	Design and locate skid trails to avoid concentrating runoff.				
	6.	Suitable location, size, and number of landings.				

MONTANA FOREST PRACTICES REVIEW WORKSHEET
BMPs Applicable to:
+ New Road Construction
# Existing Roads
➢ Reconstruction

OTHER HARVESTING ACTIVITIES SECTION IV. B. 1a. Skidding operations minimizes soil compaction and displacement.				
1b. Avoid tractor skidding on unstable slopes and slopes that exceed 40% unless not causing excessive erosion.				
2. Avoid operation of equipment within isolated wetlands.				
4. Adequate drainage for landing.				
5. Adequate drainage for skid trails.				
SLASH TREATMENT AND SITE PREPARATION SECTION IV. C. 2. Treat slash so as to preserve the surface soil horizon.				
4. Scarify only to the extent necessary to meet resource management objective.				
5. Activities limited to frozen or dry conditions to minimize soil compaction and displacement.				
6. Equipment operations on suitable slopes only.				
8. Limit water quality impact of prescribed fire.				
SECTION V – STREAM CROSSINGS				
LEGAL REQUIREMENTS SECTION V. A. ➢+ 1. Proper permits for stream crossings.				
DESIGN CONSIDERATIONS SECTION V. B. ➢+ 1a. Cross streams at right angles, if practical.				
➢+ 1b. Direct road drainage away from stream crossing site.				
➢+ 2. Avoid unimproved stream crossings.				

MONTANA FOREST PRACTICES REVIEW WORKSHEET
BMPs Applicable to:
+ New Road Construction
# Existing Roads
➢ Reconstruction

	INSTALLATION OF STREAM CROSSINGS SECTION V. C.				
➢+	1. Minimize stream channel disturbance.				
➢+	2. Stream crossing culverts conform to natural streamed and slope.				
➢+	3. Proper sizing for stream crossing structures.				
➢+	4. Prevent erosion of stream crossing culverts and bridge fills (i.e., armor inlet and outlet).				
➢+	6. Minimum cover for stream crossing culverts provided.				
	EXISTING STREAM CROSSING SECTION V. D.				
#	1. Culverts are maintained to preserve their hydrologic capacity. Adequate length to allow for road fill width. Rock armoring. Maintain fill over culvert.				
	SECTION VII – HAZARDOUS SUBSTANCE				
	GENERAL				
	1. Know and comply with regulations governing the storage, handling, etc. of hazardous substances.				

# Project included road improvements to existing road system that reduced overall sediment delivery to streams.	Y/N Comment(s):
+➢# Road system contains third party road systems.	Y/N Comment(s)

ADDITIONAL COMMENTS:

MONTANA FOREST PRACTICES REVIEW WORKSHEET

BMPs Applicable to:

+ New Road Construction

Existing Roads

➢ Reconstruction

STREAMSIDE MANAGEMENT ZONE SITE INFORMATION				
***RECOMMENDED BEST MANAGEMENT* PRACTICES**				**COMMENTS**
1a. Adequate SMZ width maintained, avg. width _____.				
1b. SMZ properly marked?				
2. Exclusion of broadcast burning in SMZ.				
3. SMZ retention tree requirements met. (# of trees, representative of pre-harvest stand, favor bank-edge and leaning trees, shrubs and sub merchantable).				
4. Exclusion of equipment operation in SMZ except on established roads.				
5. Exclude construction of roads in the SMZ except when necessary to cross a Stream or wetland.				
6. Exclusion of road fill material deposited in SMZ except as needed to construct crossings.				
7. Exclusion of side-casting of road material into a stream, lake, wetland or other body of water during road maintenance.				
8. Exclusion of slash in streams, lakes or other bodies of water.				
9. Exclude the handling, storage, application of disposal of hazardous or toxic materials in the SMZ in a manner that pollutes or causes damage or injury.				
10. Pre-approved alternative practices				
11. DNRC approved site-specific alternative practices.				

ADDITIONAL COMMENTS:

APPENDIX F

FISH PASSAGE FIELD REVIEW FORM 2012

Date:

Field Review Site Name: _____
Field Review Site Number: _____

INSTALLATION OF STREAM CROSSINGS				
SECTION V. C.				**COMMENTS**
2.	Design stream-crossings for adequate passage of fish (if present) and ensure fish passage is not impeded.			
**	Stream crossing type and/or structure modification (fords, baffles, bridges).			
a.	Structure width accommodates bankfull width. Bankfull width _____ Culvert width _____ Constriction ratio _____			
b.	Structure slope mimics upstream and downstream slope Channel slope _____ Culvert slope _____ Difference _____			
c.	Structure retains substrates representative of the upstream and downstream reaches and/or design material. % of culvert bottom with substrate _____			
d.	Structure retains water depth representative of upstream and downstream reaches. Channel water depth _____ Culvert water depth _____ Difference _____			
FISH PASSAGE SCORING TOTAL		**Application to Site (Y/N)**	**Application**	**Effectiveness**	**OVERALL COMMENTS**
Design stream-crossings for adequate passage of fish (if present) with minimum impact on water quality. Ensure fish passage is not impeded					

Application and Effectiveness Guidelines for 2010 Fish Passage BMP Field Reviews

Application Rating

Design Criteria	Rating Guidelines (Examples)	Application Rating
V.c.2.a. - structure width accommodates bankfull width	W_{strct} meets W_{bkf} (Constriction Ratio >= 0.9[1]	MORE FAVORABLE ↓ LESS FAVORABLE
	W_{strct} slightly constricts W_{bkf} (Constriction Ratio 0.7 – 0.89)[2]	
	W_{bkf} obviously not taken into consideration (Constriction Ratio <0.5)	
V.c.2.b. - Structure slope mimics upstream and downstream slope	Structure placed at stream grade (within ± 1%)[2]	MORE FAVORABLE ↓ LESS FAVORABLE
	Structure placed steeper/shallower than stream (± 1% - 3%)	
	Structure slope obviously not taken into consideration (> ± 5%)	
V.c.2.c. - Structure retains substrates representative of the upstream and downstream reaches and/or design material	Structure retaining material throughout the structure. (90-100%)[2]	MORE FAVORABLE ↓ LESS FAVORABLE
	Structure retaining material throughout a portion of structure (10-90%)	
	No substrate being retained and substrate not taken into consideration.	
V.c.2.d. - Structure retains water depth representative of upstream and downstream reaches	Water depth representative of stream channel[2]	MORE FAVORABLE ↓ LESS FAVORABLE MORE FAVORABLE
	Water depth slightly altered compared to stream channel (<50% change in depth)	
	No surface water found within structure or excessive surface water	

1 - Constriction Ratio = structure width divided by bankfull width (ex. 5' culvert/10' stream width = 0.5)
2 – Representative of the natural stream channel outside the zone of crossing-structure influence.

Application and Effectiveness Guidelines for 2010 Fish Passage BMP Field Reviews

Effectiveness Rating

Fish Passage	Rating Guidelines (Examples)	Rating
Design stream-crossings for adequate passage of fish (if present) with minimum impact on water quality. Ensure fish passage is not impeded	Not applicable or possibly in the case of a replacement	5 - Improved Passage
	No passage concerns for local species at any time of year	4 - Adequate Passage
	Passage concerns due to minor application departures	3 - Minor and temporary Passage Impediment
	Passage concerns due to major application departures	2 - Major and temporary Passage Impediment
	Passage concerns for both low and high water flow	1 - Major and Prolonged Passage Impediment

Field Review procedures and measurements:

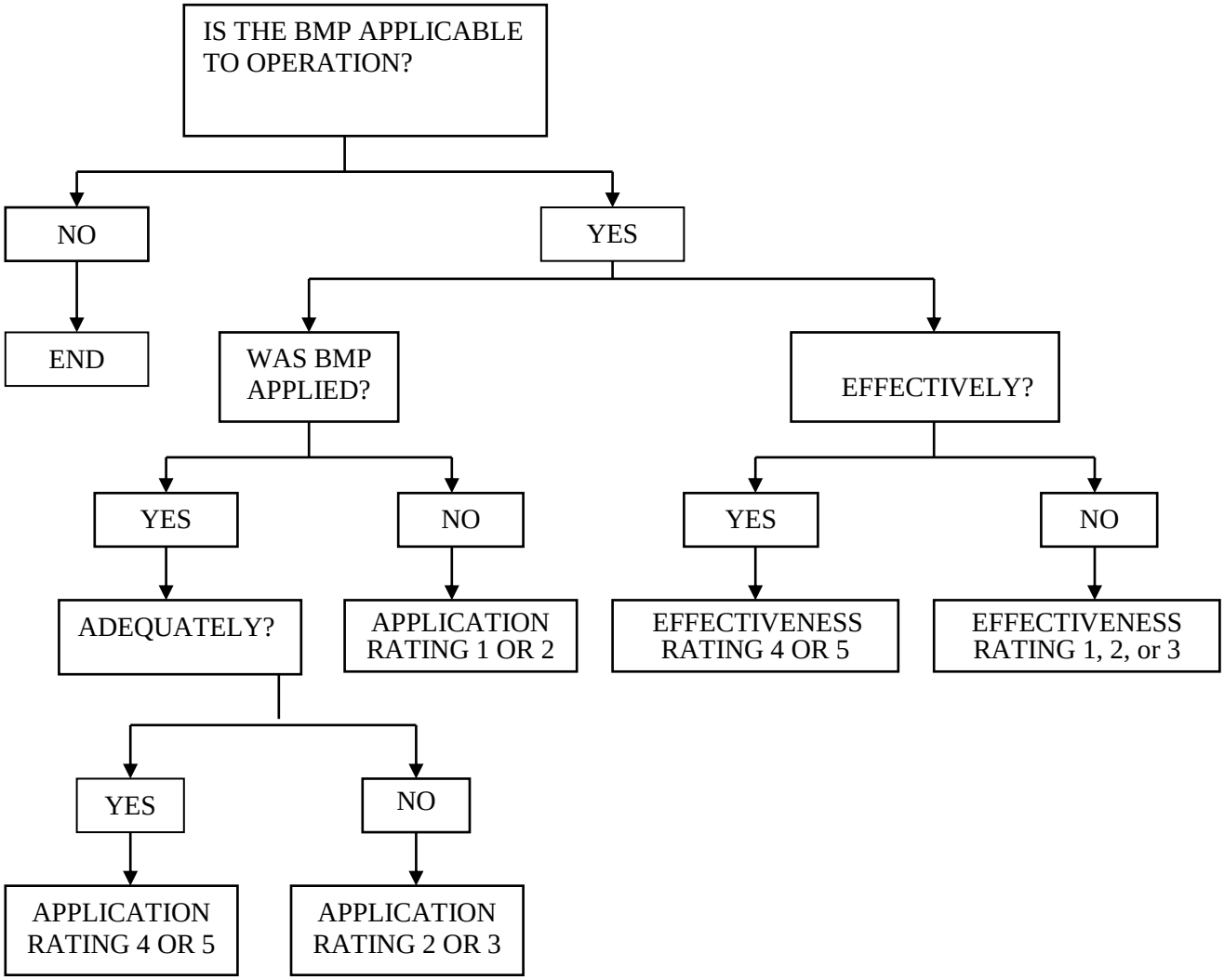
All measurements will be taken outside the zone of structure influence. (Except for culvert slope)

- Tape measurements of structure width and bankfull width.
    - Calculate constriction ratios (structure width/bankfull width)
        - Minimum of three measurements upstream and/or downstream at riffle sections, at bankfull width.
- Measurement of stream and structure slope (Clinometer)
    - Measure stream slope upstream and downstream of structure
        - Minimum of three measurements upstream and downstream, from riffle to riffle, measured in same direction.
- Substrate will be visually estimated, minimally
    - Keeping mind it is a human tendency to overestimate substrate size.
        - Consider substrates within 200 feet below and above structure. Estimate proportions of various size classes.
- Water depth will be measured with a wading staff
        - Minimum of three measurements upstream and downstream, measured at thalweg depth at bankfull width measure locations.

Detailed comments are required in order to elaborate and/or defend the effectiveness rating.

APPENDIX G

BMP FIELD REVIEW RATING FLOW CHART



APPENDIX H

2012 BMP RATINGS BY PRACTICE AND OWNERSHIP

		APPLICATION					EFFECTIVENESS				
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
III.A.1a	DNRC	0	0	0	5	0	0	0	0	5	0
	FED	0	0	0	11	0	0	0	0	11	0
	IND	0	0	0	5	0	0	0	0	5	0
	NIP	0	0	0	3	0	0	0	0	3	0
	Total:	0	0	0	24	0	0	0	0	24	0
III.A.1b	DNRC	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	12	0	0	0	0	12	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	9	1	0	0	0	10	0
	Total:	0	0	0	39	1	0	0	0	40	0
III.A.3	DNRC	0	0	0	4	0	0	0	0	4	0
	FED	0	0	0	8	0	0	0	0	8	0
	IND	0	0	0	2	0	0	0	0	2	0
	NIP	0	0	0	10	0	0	0	0	10	0
	Total:	0	0	0	24	0	0	0	0	24	0
III.A.4	DNRC	0	0	0	4	0	0	0	0	4	0
	FED	0	0	0	8	0	0	0	0	8	0
	IND	0	0	0	2	0	0	0	0	2	0
	NIP	0	0	0	3	0	0	0	0	3	0
	Total:	0	0	0	17	0	0	0	0	17	0
III.A.5a	DNRC	0	0	0	4	0	0	0	0	4	0
	FED	0	0	0	6	1	0	0	0	6	1
	IND	0	0	0	2	0	0	0	0	2	0
	NIP	0	0	0	2	0	0	0	0	2	0
	Total:	0	0	0	14	1	0	0	0	14	1
III.A.5b	DNRC	0	0	0	1	0	0	0	0	1	0
	FED	0	0	0	2	1	0	0	0	2	1
	IND	0	0	0	1	0	0	0	0	1	0
	NIP	0	0	0	1	0	0	0	0	1	0
	Total:	0	0	0	5	1	0	0	0	5	1
III.B.2	DNRC	0	0	0	5	0	0	0	0	5	0
	FED	0	0	0	10	0	0	0	0	10	0
	IND	0	0	0	3	0	0	0	0	3	0
	NIP	0	0	0	4	0	0	0	0	4	0
	Total:	0	0	0	22	0	0	0	0	22	0
III.B.4	DNRC	0	0	0	5	0	0	0	0	5	0
	FED	0	0	0	7	0	0	0	0	7	0
	IND	0	0	0	2	0	0	0	0	2	0
	NIP	0	0	0	3	0	0	0	0	3	0
	Total:	0	0	0	17	0	0	0	0	17	0

2012 BMP RATINGS BY PRACTICE AND OWNERSHIP

		APPLICATION					EFFECTIVENESS				
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
III.C.1	DNRC	0	0	0	6	0	0	0	0	6	0
	FED	0	0	3	10	0	0	2	1	10	0
	IND	0	1	1	9	1	0	1	0	10	1
	NIP	0	1	1	8	0	0	1	0	9	0
	Total:	0	2	5	33	1	0	4	1	35	1
III.C.2	DNRC	0	0	0	3	0	0	0	0	3	0
	FED	0	0	0	4	0	0	0	0	4	0
	IND	0	0	0	3	0	0	0	0	3	0
	NIP	0	0	1	2	0	0	0	0	3	0
	Total:	0	0	1	12	0	0	0	0	13	0
III.C.3	DNRC	0	0	1	4	0	0	0	0	5	0
	FED	0	0	0	9	0	0	0	0	9	0
	IND	0	0	0	11	0	0	0	0	11	0
	NIP	0	0	1	3	0	0	0	0	4	0
	Total:	0	0	2	27	0	0	0	0	29	0
III.C.4	DNRC	0	0	0	4	0	0	0	0	4	0
	FED	0	0	0	9	0	0	0	0	9	0
	IND	0	0	0	11	0	0	0	0	11	0
	NIP	0	0	0	6	0	0	0	0	6	0
	Total:	0	0	0	30	0	0	0	0	30	0
III.C.5	DNRC	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	11	0	0	0	0	11	0
	IND	0	0	0	11	0	0	0	0	11	0
	NIP	0	0	0	7	0	0	0	0	7	0
	Total:	0	0	0	35	0	0	0	0	35	0
III.C.7	DNRC	0	0	0	6	0	0	0	0	6	0
	FED	0	1	0	12	0	0	1	0	12	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	8	0	0	0	0	8	0
	Total:	0	1	0	38	0	0	1	0	38	0
III.D.2	DNRC	0	0	0	5	0	0	0	0	5	0
	FED	0	0	0	10	0	0	0	0	10	0
	IND	0	0	0	4	0	0	0	0	4	0
	NIP	0	0	0	3	0	0	0	0	3	0
	Total:	0	0	0	22	0	0	0	0	22	0
III.D.3	DNR	0	0	0	5	0	0	0	0	5	0
	FED	0	0	0	9	0	0	0	0	9	0
	IND	0	0	0	4	0	0	0	0	4	0
	NIP	0	0	0	3	0	0	0	0	3	0
	Total:	0	0	0	21	0	0	0	0	21	0

2012 BMP RATINGS BY PRACTICE AND OWNERSHIP

		APPLICATION					EFFECTIVENESS				
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
III.D.5	DNRC	0	0	0	5	0	0	0	0	5	0
	FED	0	0	0	8	0	0	0	0	8	0
	IND	0	0	0	4	0	0	0	0	4	0
	NIP	0	0	1	2	0	0	0	0	3	0
	Total:	0	0	1	19	0	0	0	0	20	0
III.D.6	DNRC	0	0	0	5	0	0	0	0	5	0
	FED	0	0	0	7	0	0	0	0	7	0
	IND	0	0	0	4	0	0	0	0	4	0
	NIP	0	0	0	3	0	0	0	0	3	0
	Total:	0	0	0	19	0	0	0	0	19	0
III.D.8	DNRC	0	0	0	4	0	0	0	0	4	0
	FED	0	0	0	8	0	0	0	0	8	0
	IND	0	0	0	4	0	0	0	0	4	0
	NIP	0	0	0	3	0	0	0	0	3	0
	Total:	0	0	0	19	0	0	0	0	19	0
III.D.9	DNRC	0	0	0	4	0	0	0	0	4	0
	FED	0	0	0	2	0	0	0	0	2	0
	IND	0	0	0	3	0	0	0	0	3	0
	NIP	0	0	0	0	0	0	0	0	0	0
	Total:	0	0	0	9	0	0	0	0	9	0
III.D.10	DNRC	0	0	0	4	0	0	0	0	4	0
	FED	0	0	0	5	0	0	0	0	5	0
	IND	0	0	0	3	0	0	0	0	3	0
	NIP	0	0	0	0	0	0	0	0	0	0
	Total:	0	0	0	12	0	0	0	0	12	0
III.E.1	DNRC	0	0	0	6	0	0	0	0	6	0
	FED	0	0	1	11	0	0	0	0	12	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	1	0	7	0	0	1	0	7	0
	Total:	0	1	1	36	0	0	1	0	37	0
III.E.2	DNRC	0	0	0	6	0	0	0	0	6	0
	FED	0	0	4	8	0	0	2	2	8	0
	IND	0	0	2	10	0	0	0	1	11	0
	NIP	0	0	2	5	0	0	0	0	7	0
	Total:	0	0	8	30	0	0	2	3	32	0
III.E.3	DNRC	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	11	0	0	0	0	11	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	6	0	0	0	0	6	0
	Total:	0	0	0	35	0	0	0	0	35	0

2012 BMP RATINGS BY PRACTICE AND OWNERSHIP

		APPLICATION					EFFECTIVENESS				
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
III.E.6	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	13	0	0	0	0	13	0
	IND	0	0	1	11	0	0	0	0	12	0
	NIP	0	0	0	9	0	0	0	0	9	0
	Total:	0	0	1	39	0	0	0	0	40	0
III.E.8	DNR	0	0	0	4	0	0	0	0	4	0
	FED	0	0	0	8	2	0	0	0	10	0
	IND	0	0	0	5	0	0	0	0	5	0
	NIP	0	0	0	2	0	0	0	0	2	0
	Total:	0	0	0	19	2	0	0	0	21	0
IV.A.2	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	13	0	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	11	0	0	0	0	11	0
	Total:	0	0	0	42	0	0	0	0	42	0
IV.A.5	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	13	0	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	11	0	0	0	0	11	0
	Total:	0	0	0	42	0	0	0	0	42	0
IV.A.6	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	13	0	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	11	0	0	0	0	11	0
	Total:	0	0	0	42	0	0	0	0	42	0
IV.B.1a	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	13	0	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	11	0	0	0	0	11	0
	Total:	0	0	0	42	0	0	0	0	42	0
IV.B.1b	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	12	1	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	11	0	0	0	0	11	0
	Total:	0	0	0	41	1	0	0	0	42	0

2012 BMP RATINGS BY PRACTICE AND OWNERSHIP

		APPLICATION					EFFECTIVENESS				
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
IV.B.2	DNR	0	0	1	4	0	0	0	0	5	0
	FED	0	0	0	6	0	0	0	0	6	0
	IND	0	0	0	11	0	0	0	0	11	0
	NIP	0	0	0	7	0	0	0	0	7	0
	Total:	0	0	1	14	0	0	0	0	29	0
IV.B.4	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	13	0	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	11	0	0	0	0	11	0
	Total:	0	0	0	42	0	0	0	0	42	0
IV.B.5	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	13	0	0	0	0	13	0
	IND	0	0	0	11	1	0	0	0	11	1
	NIP	0	0	1	10	0	0	0	0	11	0
	Total:	0	0	1	40	1	0	0	0	41	1
IV.C.2	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	1	12	0	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	11	0	0	0	0	11	0
	Total:	0	0	1	41	0	0	0	0	42	0
IV.C.4	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	13	0	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	11	0	0	0	0	11	0
	Total:	0	0	0	42	0	0	0	0	42	0
IV.C.5	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	13	0	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	11	0	0	0	0	11	0
	Total:	0	0	0	42	0	0	0	0	42	0
IV.C.6	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	12	1	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	11	0	0	0	0	11	0
	Total:	0	0	0	41	1	0	0	0	42	0
IV.C.8	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	1	12	0	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	10	0	0	0	0	10	0
	Total:	0	0	1	40	0	0	0	0	41	0

2012 BMP RATINGS BY PRACTICE AND OWNERSHIP

		APPLICATION					EFFECTIVENESS				
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
V.B.1a	DNR	0	0	0	1	0	0	0	0	1	0
	FED	0	0	0	6	0	0	0	0	6	0
	IND	0	0	0	1	0	0	0	0	1	0
	NIP	0	0	0	0	0	0	0	0	0	0
	Total:	0	0	0	8	0	0	0	0	8	0
V.B.1b	DNR	0	0	0	1	0	0	0	0	1	0
	FED	0	0	0	6	0	0	0	0	6	0
	IND	0	0	0	1	0	0	0	0	1	0
	NIP	0	0	0	0	0	0	0	0	0	0
	Total:	0	0	0	8	0	0	0	0	8	0
V.B.2	DNR	0	0	0	1	0	0	0	0	1	0
	FED	0	0	0	6	0	0	0	0	6	0
	IND	0	0	0	1	0	0	0	0	1	0
	NIP	0	0	0	0	0	0	0	0	0	0
	Total:	0	0	0	8	0	0	0	0	8	0
V.C.1	DNR	0	0	0	2	0	0	0	0	2	0
	FED	0	0	0	7	0	0	0	0	7	0
	IND	0	0	0	1	0	0	0	0	1	0
	NIP	0	0	0	1	0	0	0	0	1	0
	Total:	0	0	0	11	0	0	0	0	11	0
V.C.2	DNR	0	0	1	1	0	0	0	1	1	0
	FED	0	0	0	6	0	0	0	0	5	1
	IND	0	0	0	1	0	0	0	0	1	0
	NIP	0	0	0	1	0	0	0	0	1	0
	Total:	0	0	1	9	0	0	0	1	8	1
V.C.3	DNR	0	0	0	2	0	0	0	0	2	0
	FED	0	0	0	6	0	0	0	0	6	0
	IND	0	0	0	1	0	0	0	0	1	0
	NIP	0	0	0	1	0	0	0	0	1	0
	Total:	0	0	0	10	0	0	0	0	10	0
V.C.4	DNR	0	0	0	2	0	0	0	0	2	0
	FED	0	0	0	6	0	0	0	0	6	0
	IND	0	0	0	1	0	0	0	0	1	0
	NIP	0	0	0	1	0	0	0	0	1	0
	Total:	0	0	0	10	0	0	0	0	10	0

2012 BMP RATINGS BY PRACTICE AND OWNERSHIP

		APPLICATION					EFFECTIVENESS				
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
V.C.6	DNR	0	0	0	1	0	0	0	0	1	0
	FED	0	0	0	5	0	0	0	0	5	0
	IND	0	0	0	1	0	0	0	0	1	0
	NIP	0	0	0	1	0	0	0	0	1	0
	Total:	0	0	0	8	0	0	0	0	8	0
V.D.1	DNR	0	0	0	5	0	0	0	0	5	0
	FED	0	0	2	2	0	0	1	1	2	0
	IND	0	0	1	9	0	0	0	0	10	0
	NIP	0	0	1	2	0	0	1	0	2	0
	Total:	0	0	4	18	0	0	2	1	19	0
Hazardous Substances	DNR	0	0	0	6	0	0	0	0	6	0
	FED	0	0	0	13	0	0	0	0	13	0
	IND	0	0	0	12	0	0	0	0	12	0
	NIP	0	0	0	11	0	0	0	0	11	0
	Total:	0	0	0	42	0	0	0	0	42	0
GRAND TOTAL:		**0**	**4**	**28**	**1268**	**9**	**0**	**10**	**6**	**1288**	**5**

		APPLICATION					EFFECTIVENESS				
Practice	**Owner**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**

APPENDIX I

SUMMARY OF 2012 FIELD REVIEW DEPARTURES AND IMPACTS BY BMP

BMP Sec	BMP Sub	BMP	APP 2	APP 3	APP Total	EFF 2	EFF 3	EFF Total	Grand Total
III	C	1	2	5	7	4	1	5	12
III	C	2	0	1	1	0	0	0	1
III	C	3	0	2	2	0	0	0	2
III	C	7	1	0	1	1	0	1	2
III	D	5	0	1	1	0	0	0	1
III	E	1	1	1	2	1	0	1	3
III	E	2	0	8	8	2	3	5	13
III	E	6	0	1	1	0	0	0	1
IV	B	2	0	1	1	0	0	0	1
IV	B	5	0	1	1	0	0	0	1
IV	C	2	0	1	1	0	0	0	1
V	C	2	0	1	1	0	1	1	2
V	C	8	0	1	1	0	0	0	1
V	D	1	0	4	4	2	1	3	7
Totals			4	28	32	10	6	16	48

* - High Risk BMPs

APPENDIX J

COMPARISON OF 2010 AND 2012 RESULTS

Application of BMPs for All Rated Practices by Ownership Group and Rating Category

Ownership Group	Number of Practices Rated		Percentage (%) Practices Rated As							
			Meet or Exceed		Minor Departures		Major Departures		Gross Neglect	
	2012	2010	2012	2010	2012	2010	2012	2010	2012	2010
DNRC	224	227	99.7%	99%	1.3%	1%	0%	0%	0%	0%
Federal	459	554	97.2%	96%	2.6%	3%	0.2%	1%	0%	0%
Industry	353	468	98.3%	98%	1.5%	2%	0.2%	0%	0%	0%
NIPF	273	220	96.4%	97%	2.9%	3%	0.7%	0%	0%	0%
All Sites	1,309	1,469	97.6%	97%	2.1%	2%	0.3%	<1%	0%	0%

Field Review Sites with Application Departures And the Average Number of Departures per Site

Ownership Group	Total # of Sites		Percentage (%) of Sites w/out Departures		Percentage (%) of Sites With Departures						Average Number of Departures per Site*					
			Meet or Exceed		Minor		Major		Gross Neglect		Minor		Major		Gross Neglect	
	2012	2010	2012	2010	2012	2010	2012	2010	2012	2010	2012	2010	2012	2010	2012	2010
DNRC	6	6	83%	67%	17%	33%	0%	0%	0%	0%	0.5	0.33	0.00	0.00	0.00	0.00
Federal	13	16	54%	44%	46%	56%	15%	13%	0%	0%	0.92	1.06	0.08	0.31	0.00	0.00
Industry	12	15	67%	47%	33%	47%	8%	0%	0%	0%	0.42	0.60	0.08	0.00	0.00	0.00
NIPF	11	8	55%	63%	45%	37%	9%	0%	0%	0%	0.73	0.75	0.18	0.00	0.00	0.00
All Sites	42	45	64%	51%	40%	47%	10%	4%	0%	0%	0.67	0.76	0.10	0.11	0.00	0.00

Effectiveness of BMPs for All Rated Practices by Ownership Group and Rating Category

Ownership Group	Number of Practices Rated		Percentage (%) Practices Rated As							
			Adequate Protection		Minor/Temp. Impacts		Major/Temp. Or Minor/ Prolonged		Major/ Prolonged	
	2012	2010	2012	2010	2012	2010	2012	2010	2012	2010
DNRC	224	227	99.6%	99%	0.4%	0%	0%	<1%	0%	0%
Federal	459	554	97.8%	97%	0.9%	<1%	1.3%	2%	0%	<1%
Industry	353	468	99.4%	99%	0.3%	1%	0.3%	<1%	0%	0%
NIPF	273	220	98.9%	99%	0%	<1%	1.1%	0%	0%	0%
All Sites	1,309	1,469	98.8%	98%	0.4%	<1%	0.8%	1%	0%	<1%

Field Review Sites with Impacts (BMP Effectiveness) And the Average Number of Impacts per Site

Ownership Group	Total # of Sites		Percentage (%) of Sites w/out Impacts		Percentage (%) of Sites With Impacts						Average Number of Impacts per Site*					
			Adequate or Improved Protection		Minor/ Temp.		Major/Temp. Minor/ Prolonged		Major/ Prolonged		Minor/ Temp.		Major/Temp. Minor/ Prolonged		Major/ Prolonged	
	2012	2010	2012	2010	2012	2010	2012	2010	2012	2010	2012	2010	2012	2010	2012	2010
DNRC	6	6	83%	83%	17%	0%	0%	17%	0%	0%	0.17	0.00	0.00	0.17	0.00	0.00
Federal	13	16	62%	56%	23%	13%	15%	25%	0%	13%	0.31	0.13	0.46	0.56	0.00	0.13
Industry	12	15	92%	73%	8%	20%	8%	7%	0%	0%	0.08	0.27	0.08	0.07	0.00	0.00
NIPF	11	8	82%	75%	0%	25%	18%	0%	0%	0%	0.00	0.25	0.27	0.00	0.00	0.00
All Sites	42	45	79%	69%	12%	16%	12%	19%	0%	4%	0.14	0.18	0.24	0.24	0.00	0.05